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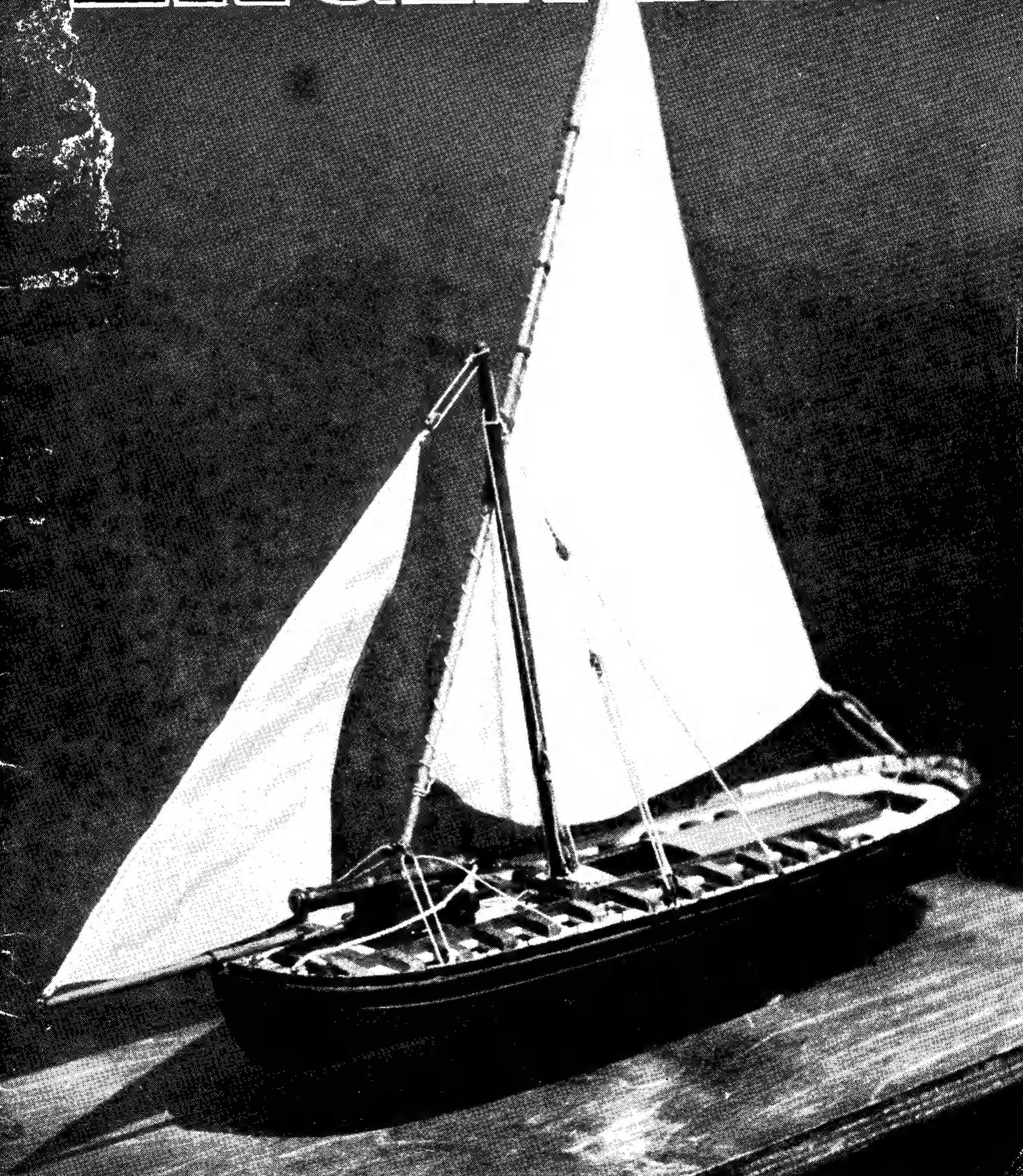
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

6TH SEPTEMBER 1951 VOL. 105 NO. 2624

SMOKE RINGS

Our Cover Picture

● THE MODEL shown this week is somewhat out of the ordinary in that it represents a small and little-known type of ship. Most model makers, especially those of historical ships, seem to be interested only in the larger and more important ships. The model illustrated was made by Mr. H. A. Kirby, of Mitcham, Surrey, and was exhibited at our recent MODEL ENGINEER Exhibition. It represents a small open boat fitted with one large gun. The rig is somewhat unusual, consisting of a lateen sail on a single mast with a bowsprit and jib. This gives it a resemblance to the ships of the Mediterranean but it is more likely that the lateen was derived from the lateen used on the mizen mast in ships of its period. This type was designed for use in harbours and shallow waters, probably for cutting out ships by taking them by surprise in a way impossible for a large ship. It could also be used for a surprise attack on a fort, especially if numbers of them were employed. The type is represented in our modern Navy by H.M.S. *Erebus* and H.M.S. *Terror*, comparatively small ships of shallow draft, carrying a single turret containing two heavy guns, these being almost the only armament of the ship. In his choice of a prototype Mr. Kirby deserves our commendation for two reasons. First, he has shown us a type of ship not often modelled, and in doing so has made one of the very few representations of this model, and second, he has been enabled to use a scale at which practically every detail can be faithfully reproduced. Mr. Kirby had a similar type of model in last year's Exhibition when he showed a model of a Severn trow, the only one we remember to have seen. The trow model has been greatly in demand for exhibitions in the Severn area where it has aroused a considerable amount of interest.

The drawings on which Mr. Kirby based this year's model, the gun boat, were made from the original drafts, copies of which can be obtained from The National Maritime Museum.

The Family Spirit

● IN REPORTING our Exhibition, one of the daily papers referred to it as the *Marine* Exhibition. Possibly this was due to the imposing array of ships and yachts that were on the competition stand near the entrance, combined with the cumulative effect of the prototype steamers as one continued down the passage, and a large tank which faced one at the end of the passage. Marine modelling is undoubtedly a large and important section of our modelling activities, but we hardly consider that they steal the show to this extent. The most ardent ship modeller often has a model locomotive stowed away somewhere from his early days, and we know of more than one who, after winning prizes with his ship models, has turned to railway or aeroplane modelling. It is this community of interest which binds us all together and makes such a happy family of the visitors to our Annual Exhibition.

The Giant Model Airship

● VISITORS to the Exhibition will doubtless have noted that the model airship recently referred to in these notes did *not* carry out regular radio-controlled flights in the hall. After final consideration and discussion with the appropriate authorities, the organisers with very great regret decided that, in the event of mishap, the danger of fire to the hall and its contents constituted a greater risk than it was advisable to accept.

Better Ship Models

● FOR THE ship modeller, the most encouraging thing about this year's "M.E." Exhibition was the considerable improvement which has been made in the general standard of the models. Instead of a few really outstanding models and a host of mediocre ones, there seemed to be, in addition to the best models, a large number of really good ones, and not so many that are not so good. This indicates that more care is being taken, both in the research work and in the carrying out of the actual work. We consider that our Exhibition is entitled to a good deal of the credit for this. For the model maker to enter his model for competition and later to see it displayed with those of other competitors benefits him in two ways; first, it compels him to put his best into his work, knowing that it will be carefully examined by critical eyes, and second, his own inspection of the models of other competitors shows him what can be done, and frequently gives him ideas as to better methods of constructing and finishing his own model.

Submarine Cable Exhibits

● THE TELEGRAPH Construction & Maintenance Co. Ltd., Telcon Works, Greenwich, kindly loaned models at the "M.E." Exhibition relating to the submarine cable industry, for it is just 100 years ago, on September 25th, 1851, that the first practical submarine telegraph cable, comprising four gutta percha insulated conductors protected by a steel wire armouring, was laid across the English Channel.

The insulated conductor of this cable, like the short-lived unprotected insulated wire laid across the Channel in 1850, the centenary of which was celebrated last year, was manufactured by The Gutta Percha Company, one of the parents of The Telegraph Construction & Maintenance Company, which made the first successful Atlantic telegraph cable, laid by the *Great Eastern* in 1866. A working model, over 100 years old, which was constructed by John Scott Russell, the builder of this famous ship, was shown, as well as a model of the Atlantic sea bed, showing the routes of important submarine cables. Specimens of the first Atlantic cables were also shown, together with a model of the cable ship *Colonia* (1902-1928) which laid over 80,000 nautical miles of submarine cable during her long career.

Apologies

● WE ARE conscious of the fact that a great deal of correspondence has flowed into our editorial sanctum during the past few weeks and that much of it remains unanswered. We offer our apologies to the correspondents concerned and we hope that, in due course, we shall be able to deal with the matters they raise.

During the period immediately prior to the "M.E." Exhibition, staff holidays tend to cause delay in dealing with correspondence. After that, there is the extra work that is involved in preparing the special "Exhibition" issues of the "M.E."; this is in addition to the normal weekly routine, and concerns the advertising, editorial and printing departments, all of which make special arrangements to meet the situation.

Many of our readers' letters contain requests for information of various kinds that require research before we can reply, and we are unable to give the necessary time for this. We would therefore ask for the indulgence of readers who may still be waiting to hear from us.

An Exhibition Cancelled

● WE HAVE been advised by the hon. secretary of the Torbay Society of Model Engineers that the exhibition which was to have been held in Torquay early in September has been cancelled. Instead, a series of exhibitions will be held in the club's workshop in Ellacombe (Torquay) next December.

There have lately been some good film shows in the clubroom and they have been very much enjoyed. Silent and sound films have been included, and it is hoped that the series can be continued during the coming season.

There is room for more adult members; anyone interested who can give some time to the club and its activities should get into touch with the hon. secretary, Mr. F. H. Beynon, 107, Ilsham Road, Torquay.

Incidentally, any members of other clubs who may be visiting Torquay or the neighbourhood, will be warmly welcomed.

For Steam Car Enthusiasts

● THERE ARE many of our readers who are very interested in steam cars, and we often regret that, due to present conditions, we find it impossible to allocate space to this subject which, after all, really does not come within the scope of THE MODEL ENGINEER.

However, Mr. J. N. Walton, hon. secretary of the British Light Steam Power Society, has informed us that, at the Waldorf Hotel, London, W.C.2, at 3 p.m., on Saturday, September 22nd, Mr. M. Harman Lewis will be giving a lecture entitled "The Problem of the Steam Car." Mr. Lewis, who is well known to us, is an expert in this particular subject; therefore, his lecture is sure to be informative and up to date, as well as being based largely upon personal experience.

Incidentally, the British Light Steam Power Society is open to all interested persons—lack of technical knowledge is no bar—and is doing much to aid the modern development of small power steam units, now being carried out in this country. Enquiries are invited and should be addressed to the Secretary, British Light Steam Power Society, "Craig View," Cannan Avenue, Kirk Michael, Isle of Man. A stamped addressed envelope will be appreciated.

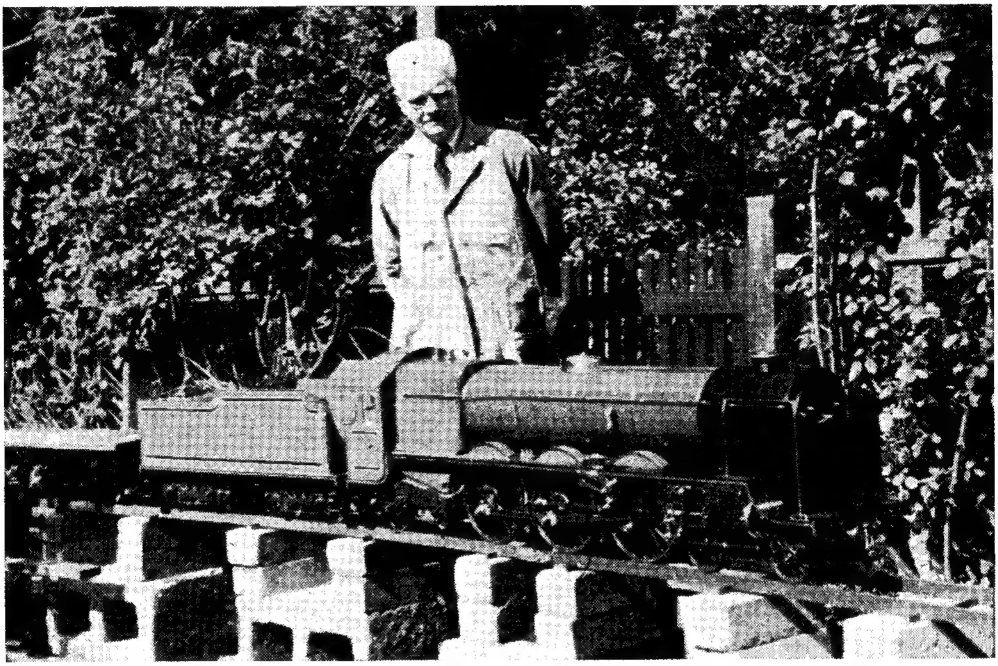
A 5-in. Gauge Free-Lance 4-6-2 Type Engine

Another Locomotive by Mr. Mahony

by R. Graeme Orr (Australia)

IN a manner of speaking, this 5-in. gauge locomotive was really born in a Japanese prison camp.

Until going to the war, my interest had been in $2\frac{1}{2}$-in. gauge for a scenic line, as a result of which Mr. J. J. Mahony had been stimulated and adopting 5-in. gauge. In this my wife aided and abetted me, but after that she turned me down cold. A nice handy design such as a 4-4-0 or 0-6-0, or even 2-6-0, was considered, but I was informed that "only a nice long engine" would be tolerated—"no short stubby horrors."



The designer and builder, Mr. J. J. Mahony, with the 5-in. gauge free-lance locomotive

to build a three-cylinder Pacific, the chassis being completed one week before I went overseas. He also built another, a 4-6-4 with two cylinders while I was away, also in $2\frac{1}{2}$-in. gauge.

But discussion in the prison camp "model railway club" (without locomotives, track or even a signal) showed that the modern trend was toward $3\frac{1}{2}$-in. gauge, and even 5-in. gauge, as the details were more readily scaled.

On my return, the recently-formed Surrey Hills Live Steamers initiated me into the delights of passenger-hauling in $2\frac{1}{2}$-in. gauge. It was here that my wife stepped in and expounded on the "cruelty to dumb animals" as practised on these small locomotives. "A small thing like that to pull you big men! And besides, it looks quite ridiculous!" So I suggested we should go the whole hog, avoiding $3\frac{1}{2}$-in. gauge And it had to have a leading bogie—a pony was definitely out, as it would give the appearance of a "praying mantis." The valve-gear must be Walschaerts, with its rods and links—Baker gear would certainly *not* do.

We had a conference with Mr. Mahony who was all for $7\frac{1}{4}$-in. gauge, but I pointed out that the space allowed me in the garden by my wife would not allow this, particularly as she wanted a "long engine." So he partly sided with her and designed the Pacific. As to the outline, he accepted my suggestion of L.M.S. influence on his design.

There were several parts available from another locomotive, and I suggested that these might be worked in, to save time; but the further he went with the design, the more impossible this became, and a start had to be made from scratch.

Any castings required had to have a pattern made by Mr. Mahony; consequently, the components are mostly made from solid plate and bar. The wheels and cylinders are cast-iron. As Mr. Mahony has a phobia against wheel spin, he increased the weight of the locomotive wherever possible. This, of course, affects its transportability, but produced a very rugged construction.

The Frames

These are $\frac{3}{16}$ in., the buffer and drag beams $\frac{1}{4}$ in., the motion plate $\frac{3}{8}$ in., and there are several $\frac{3}{4}$ in. frame stays. The frames and buffer beams are bolted and nutted, but again, he has put in as many $\frac{3}{16}$-in. bolts as he could reasonably manage, in spite of having to make many of the bolts himself, for they were unobtainable here at the time of building.

The bogie is built up from two pieces of $\frac{1}{8}$-in. steel on each side, properly spaced to form side members.

The trailing frame consists of $\frac{1}{4}$-in. bar let into milled slots in $\frac{5}{16}$ in. cross-pieces, and then bolted to them.

The pony truck is of $\frac{3}{16}$-in. steel, cut out where necessary. The hornblocks are of $\frac{3}{8}$-in. steel plate, bolted to the frames, and slotted to take the axleboxes. Here I cramped Mr. Mahony's style. He made solid steel axleboxes, in one piece, intending to harden them and run hardened steel axles in them. He had already built two successful and long-lived $2\frac{1}{2}$-in. gauge locomotives with this feature. But, rightly or wrongly, I did not like the idea of the heavy weight of the locomotives, and besides, there was always the possibility that the axleboxes might have to be replaced in the future, if wear occurred. I, therefore, got him to give me split bronze boxes, which were made of correct pattern, and with lubrication pads. The axles are hardened. The bogie and trailing wheels are $3\frac{1}{2}$ in. diameter and the driving wheels $7\frac{1}{4}$ in.

The crankpins are $\frac{5}{8}$ in. diameter and hardened. The coupling-rods are $\frac{3}{8}$ in. thick, and the connecting-rod is made from $\frac{1}{2}$-in. steel.

Cylinders

These are of cast-iron, $1\frac{5}{8}$ in. $\times$ $2\frac{1}{2}$ in. with slide valves. Mr. Mahony refused to make piston valves for me, although he had fitted them successfully to a $10\frac{1}{4}$-in. gauge locomotive some years ago (quoted and illustrated in Henry Greenly's "Walschaerts Valve Gear," page 61 and 62, 1st edition, and described previously in THE MODEL ENGINEER). He visualised my "listening to the blow up the chimney." So slide valves of large dimensions were fitted, actuated by Walschaerts valve gear with large box links. The valve spindle is centrally placed in the valve and is offset, and is driven by another one running in guides. Access to the valves is by a square-plug screwed cap, $1\frac{1}{2}$ in. in diameter, giving a clear view of the vitals. Pistons are fitted with proper rings.

Motion Work

Piston-rods, crosshead and guide-bars are all massive, and with ample bearing surface. The valve-actuating rods, links and levers were specially designed for the engine. All pins, links, etc., are hardened to minimise wear. The ports are $\frac{7}{8}$ in. long and $\frac{1}{8}$ in. wide. Reverse is by square-threaded screw and nut. Lubrication is by means of two arms, one to each cylinder, worked by cam-actuated lever, and with spring return. The lubricator is between the frames, and behind the smokebox, driven by the pump eccentric. The oil enters the steam pipes just before they enter the valve chambers. The boiler follows "L.B.S.C.'s" design for a 5-in. gauge *Hielan' Lassie*. It is 6 in. diameter of $\frac{3}{16}$-in. copper. The throatplate and backplate are made from castings, and the firebox is of 5/32-in. copper, well stayed. A combustion-chamber is fitted, with six water-tubes. The fire-tubes are $\frac{1}{2}$ in. and the four superheater tubes 1 in. in diameter. The tube walls are rather thicker than specified, owing to non-availability of the correct article, but the conductivity of copper is so good that there is probably very little difference. The barrel is screwed into the throatplate.

The combustion chamber and tubes are brazed in the region of the firebox, but the firebox wrapper and backplate are held by special phosphor-bronze screws, and then caulked with a special grade soft solder. In the front tube plate the tubes are expanded, and then soft soldered.

The stays are screwed, riveted over and soft soldered. Four superheater elements are fitted two to each cylinder. Two safety valves are fitted, and lift at 85 lb. per sq. in.

The backhead fittings include regulator, blower valve, injector valve, whistle valve, and one water-gauge with three cocks. The pressure gauge is by Stuart. There are also a vacuum brake handle, a cylinder drain valve handle, and an ash pan damper handle in the cab. Steam is collected from a pipe well forward in the corner of the Belpaire firebox. The fire door is larger than specified by "L.B.S.C."

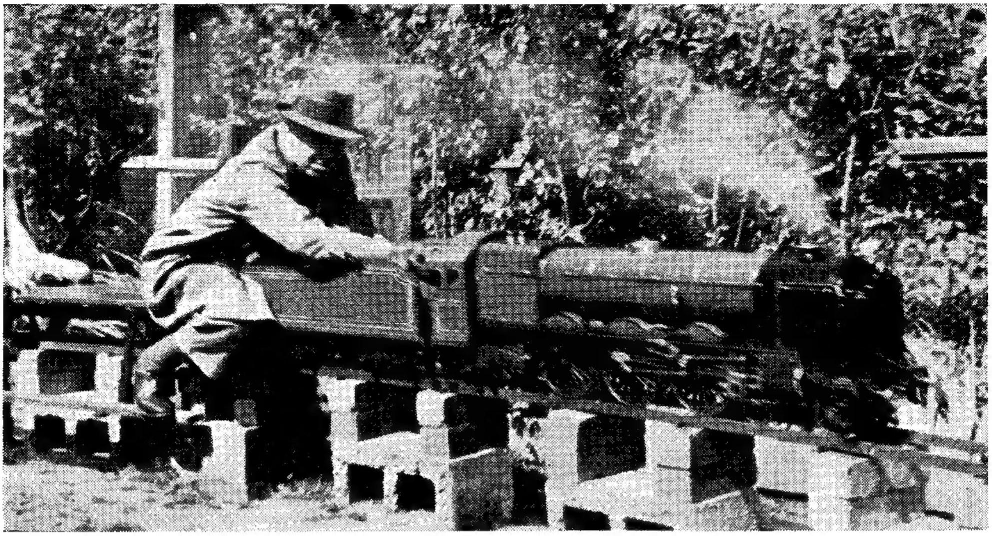
Firing

The boiler is fired by charcoal; or by red box-wood (red gum) which comes from a very dry area, and has little volatile matter. Both these are very clean, and give an intensely hot fire with very little smoke or ash. Charcoal burns more easily than coke, and has not the same tendency to go out when the engine is left standing.

We use charcoal here in Australia as a fuel for $2\frac{1}{2}$-in. and $3\frac{1}{2}$-in. gauge locomotives, almost to the exclusion of any other fuel. Owing to the extremely good steaming properties of the boiler, I have had to open up the blast nozzle to 11/32 in. to keep the fire within reason.

Alarming

The first time I raised steam, principally to try the effects of coke, coal, wood and charcoal in the firebox, the gauge needle went round so quickly to 85 lb. that I became alarmed, but all my efforts to stop it only seemed to increase its speed. Add to this that the valves did not lift at 85 (they had not been finally adjusted), and when the needle reached 95 lb. I began to be

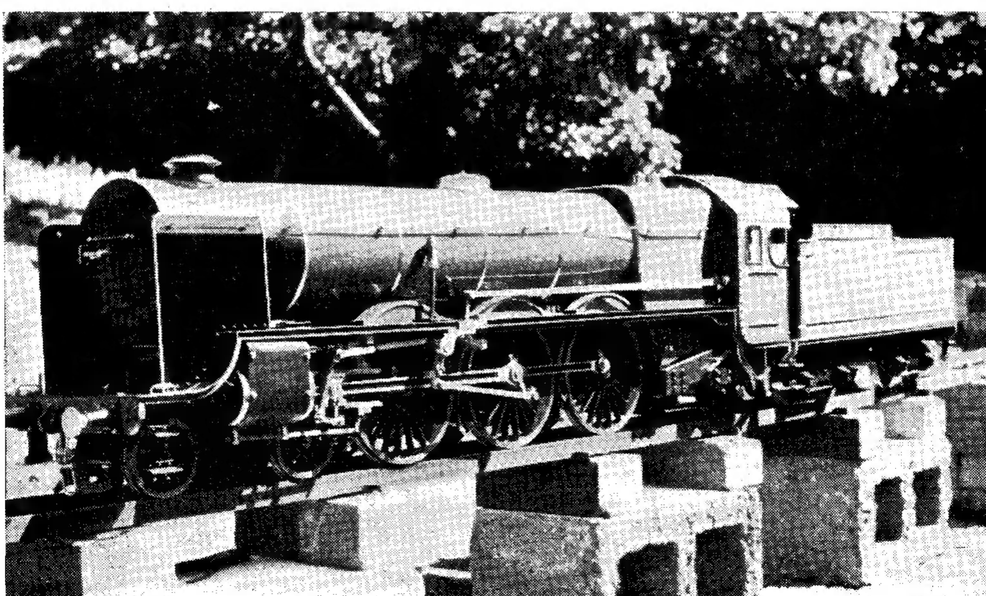


The owner driving

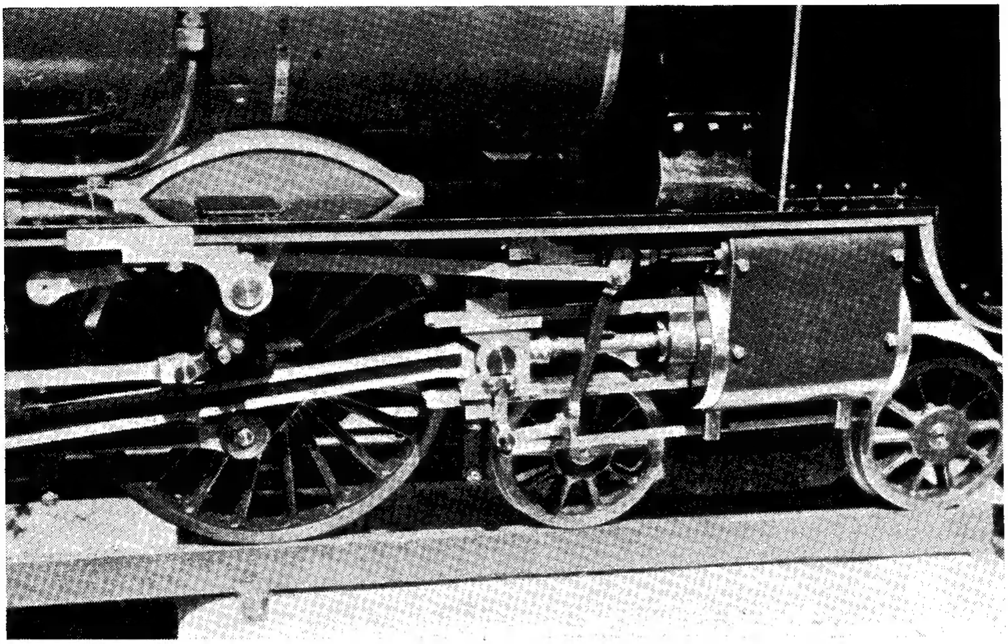
afraid the soft solder might run. At about 100 lb. I began to be afraid the solder would *not* begin to run. Soon after this the valves lifted, and the fire began to down a bit. Anyhow, all ended well. The boiler is fed by an axle-driven pump, $\frac{1}{2}$ in. by $\frac{1}{2}$ in., and also by a small injector. The locomotive has no difficulty in pulling all the load that I can put on my two 5 ft. long passenger trucks.

Painting

As regards paint work, the locomotive started off with a coat of L.M.S. red to the chassis, this being Mr. Mahony's favourite colour. But the supply ran out, and could not be replaced here by a similar quality. So the superstructure of both locomotive and tender is painted blue, and lined with black, and thin white line. Buffer beams, and beading beneath running board are



On the track



The motion work

signal red; and running boards, smokebox and deflectors are black. Top of funnel, dome, safety valves and boiler bands are polished brass. (A coloured reproduction of the locomotive appeared on the cover of the August 23rd issue this year.)

The tender follows the design of the Victorian Railways, holds approximately 5 gallons of water and is fitted with a fine gauze strainer; there is also a baffle plate, to prevent the water surging in the tender. A hand pump has not been fitted.

On the track, the engine gives a good performance, and can be notched up almost to the centre. Mr. Mahony says it is the best he has ever done with valve-gear. There is no doubt about the power and acceleration at full link and with the regulator full open. When, once warmed up, she will run with 20 lb. on the gauge, around the circular track.

The Track

This is 68 ft. diameter and consists of 1 in. by $\frac{5}{16}$ in. steel bar, welded into place in $\frac{1}{2}$ in. $\times$ $\frac{1}{2}$ in. $\times$ $\frac{1}{8}$ in. angle-iron, gang-milled at $5\frac{1}{16}$ in. gauge, to receive it. The sleepers are spaced at 16-in. centres. The rails were made in 10 ft. curved sections in a jig. This was arranged by fixing sleepers with the correct superelevation on a couple of stout wooden bearers.

The rails were each given a slight bend at each end in the direction in which they would finally curve. They were then placed in the jig sleepers which gave the whole rail the correct curvature. The proper sleepers were then fitted beneath the rail and held in position by a wooden wedge while being welded, bottom and sides, to prevent spreading. When the rail section, thus finished, was removed from the jig, it retained its correct curvature. The fishplate bolt-holes were then jig-drilled in the outer rail at both ends, and the inner rail at one end only, the second end being drilled with the rails laid in position.

Travel Comfort

The rails were laid on concrete blocks and bricks to a minimum of 9 in. above the ground, and were not fastened down in any way. This amount of elevation allowed the feet to be carried on running boards, six inches below the rail running surface, giving comfort and stability to the passengers.

A great deal of work was involved in getting the track to lie smoothly, and finally the sections had to be bent, each separately, to take out the hump-backed effect produced by laying rigid bars on edge, with curvature, superelevation and rail cant. The final result gave very smooth running, though 68 ft. diameter is rather small for an engine of this size and speed.

The best time done—not without some trepidation on the part of the driver—has been a lap of 213 ft. in 16 sec., or just about 9.1 m.p.h.

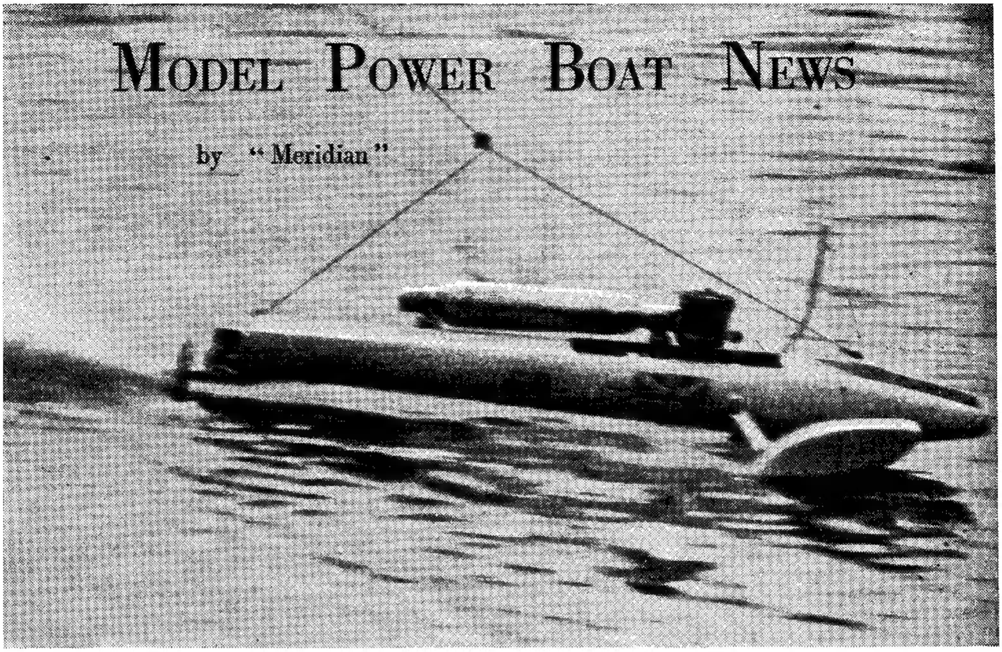


Photo by] [*Norman Verby*
Mr. R. Phillips's "Foz II" travelling at 61 m.p.h. on Longholme Lake, Bedford

BOATS and power plants showing new features of design are seen from time to time at the various regattas, and two outstanding examples seen recently deserve special mention.

The first of these made an appearance at the S. London Regatta, and was an entirely original type of hydroplane propelled by paddle-wheels! This unique boat is by G. Lines (Orpington), and it caused much interest and speculation among the power-boat men. The engine, which is a 30 c.c. two-stroke, with ported crankshafts for twin carburettors, is arranged athwart the boat. The crankshaft journals are fairly long and small flywheels are fitted which project into paddle boxes. On each flywheel four small blades are slotted in, and these blades are just submerged when the boat is in normal running position. Apart from being turned 90 degrees, the engine is situated in much the same place as on conventional hydroplanes, and the sponson tips end just before the paddles. The paddle-boxes are blended into the hull outline, and are used in order to prevent undue splashing when starting up. A lot of thought and hard work has gone into the making and development of this boat, and although the speed recorded—22 m.p.h. to be exact, is not high, Mr. Lines deserves every praise for a bold effort, and the further development of this unusual craft will be watched with great interest.

Example No. 2, is a partly finished 15 c.c. V-twin, four-stroke engine, fitted with a supercharger, and made by Mr. Stalham, of Kings Lynn. This engine was modestly shown to a few enthusiasts at the Bedford Regatta, and all who saw it expressed their appreciation of a fine piece of work. Features of design include a flywheel magneto, and a sliding vane type blower, driven at engine speed by the crankpin (engine has overhung crank). The cylinders, each of $7\frac{1}{2}$ c.c. capacity, are situated 45 degrees apart, the reason being the difficulty of using a single magneto for both cylinders if the angle is increased to, say, 90 degrees, which is the most favourable angle for a V-twin from the balancing aspect. The workmanship on the engine is superb, and although multi-cylinder engines are notoriously tricky things for speed work, it is hoped that a good performance will be achieved.

Recent Regattas

The South London S.M.E. Regatta, held at Brockwell Park, S.E., was unfortunately marred by a violent thunderstorm, which lasted well over an hour, and at one time it was thought that the regatta might have to be abandoned. In spite of this handicap, however, the programme was successfully completed in good time.

The class "A" hydroplanes were well off form at this regatta, and the best all-round performance was put up by the class "C" boats. The highest speed of the day—60.1 m.p.h., was made by R. Phillips's Class "C" boat *Foz II*, and the runners-up in this event were nearing this speed. The Class "D" race, too, was won at the highest speed to date for this size of engine, by W. Everett's 5 c.c. Dooling-engined boat, which completed the three laps at an average of 54.8 m.p.h. No other Class "D" boats returned a time for this race.

Mr. G. Lines with his paddle-driven hydroplane

The Class "C" (restricted) race went to G. Stone (Kingsmere) who at last returned a high speed with *Lady Bobs II* at a home regatta.

In the Class "B" race only G. Lines's *Sparky II* completed the distance. F. Jutton's *Vesta II* and N. Hodge's *Sparta* both failed to finish, the former boat seizing a valve at both attempts.

Results

500 yd. Class "A" Race

(1) E. Walker, Kingsmere, *Boxotrix*	40.5 m.p.h.
(2) J. Innocent, Victoria, *Betty*	23 m.p.h.

500 yd. Class "B" Race

(1) G. Lines, Orpington, *Sparky II*	46.07 m.p.h

500 yd. Class "C" Race

(1) R. Phillips, S. London, *Foz II*	60.1 m.p.h.
(2) W. Everett, Enfield, *Ann* ..	58.7 m.p.h.
(3) L. Pinder, Kingsmere, *Rednip*	55.5 m.p.h.

500 yd. Class "C" (Restricted) Race

(1) G. Stone, Kingsmere, *Lady Babs II*	58.7 m.p.h.
(2) W. Everett, Enfield	31 m.p.h.

300 yd. Class "D" Race

(1) W. Everett, Enfield	54.8 m.p.h

Nomination Race

	Error
(1) J. Thomas, Blackheath, *Rose*	5 per cent.
(2) E. Walker, Kingsmere, *Coron*	7 per cent.

Steering Competition

(1) E. Walker, Kingsmere, *Coron*	11 pts.
(2) J. Benson, Blackheath, *Comet*	9 + 5
(3) A. Clay, Blackheath, *Elizabeth*	9 + 3

The Bedford M.E.S. Regatta

This regatta was very well supported by a large entry, and this year the weather was very fine—in contrast to last year's regatta, which was marred by rain—not to mention mud! There were 56 boats entered for the various events and some 15 clubs were represented among these entries. The Victoria Club, in particular, was represented in force, a coach and a lorry bringing competitors and boats. The Steering and Nomination events were contested by some 30 boats, and keen competition was the result, although nearly all the boats were handicapped to some extent by the floating weed that is prevalent in the Longholme lake at this time of year. The winner was a prototype boat, *Queen Mary*, by Mr. Loe, of the St. Albans Club, with a score of 9 points. An interesting new boat to make an appearance was J. B. Skingley's *Josephine*, a nicely made launch fitted with a 30 c.c. four-cylinder "Seal Major" petrol engine.

The Bedford water seems quite good for high speed; there were few capsizes in the speed events, and the best speed of the day was 61.4 m.p.h., made by R. Phillips with *Foz II* Class "C." In the Class "A" race, S. H. Clifford, Victoria, repeated his success at the St. Albans Regatta by recording 55.6 m.p.h. with *Blue Streak*, E. Walker, Kingsmere, coming second with 50.1 m.p.h., the best speed of *Boxotrix* to date.

All the events went off well, and the Bedford Club are to be congratulated for a very fine regatta—not forgetting the ladies, who provided many cups of tea.

Mr. B. Stalham, of Kings Lynn, with "Tha II"

Results

Steering Competition

(1)	M. Loe, St. Albans, *Queen Mary*	9 pts.
(2)	T. Curtis, Victoria, *Micky*	8 „
(3)	W. Morss, Victoria, *Belle Morss*	7 „

500 *yd. Class "B" Race*

(1)	G. Lines, Orpington, *Sparky* 2	55.6 m.p.h.
(2)	F. Jutton, Guildford, *Vesta II*	42.2 m.p.h.
(3)	Mr. Stalham, Kings Lynn, *Tha II*	40.6 m.p.h.
(3)	Mr. Dalziel, Bournville, *Naiad* 2	40.6 m.p.h.

300 *yd. Class "D" Race*

(1)	Mr. Hyder, Victoria, *Slipper*	45.8 m.p.h.
(2)	W. Everett, Enfield	37.4 m.p.h.
(3)	Mr. Pinchin, Blackheath, *Black Widow*	32.2 m.p.h.

Nomination Race, 50 *yd.*

		error
(1)	Mr. Phillips, Victoria, *Kenvera*	1.43 per cent.
(2)	W. Morss, Victoria, *Belle Morss*	3.16 per cent.
(3)	Mr. Croll, St. Albans, *Foxbar*	5.69 per cent.

300 *yd. Class "C" Race*

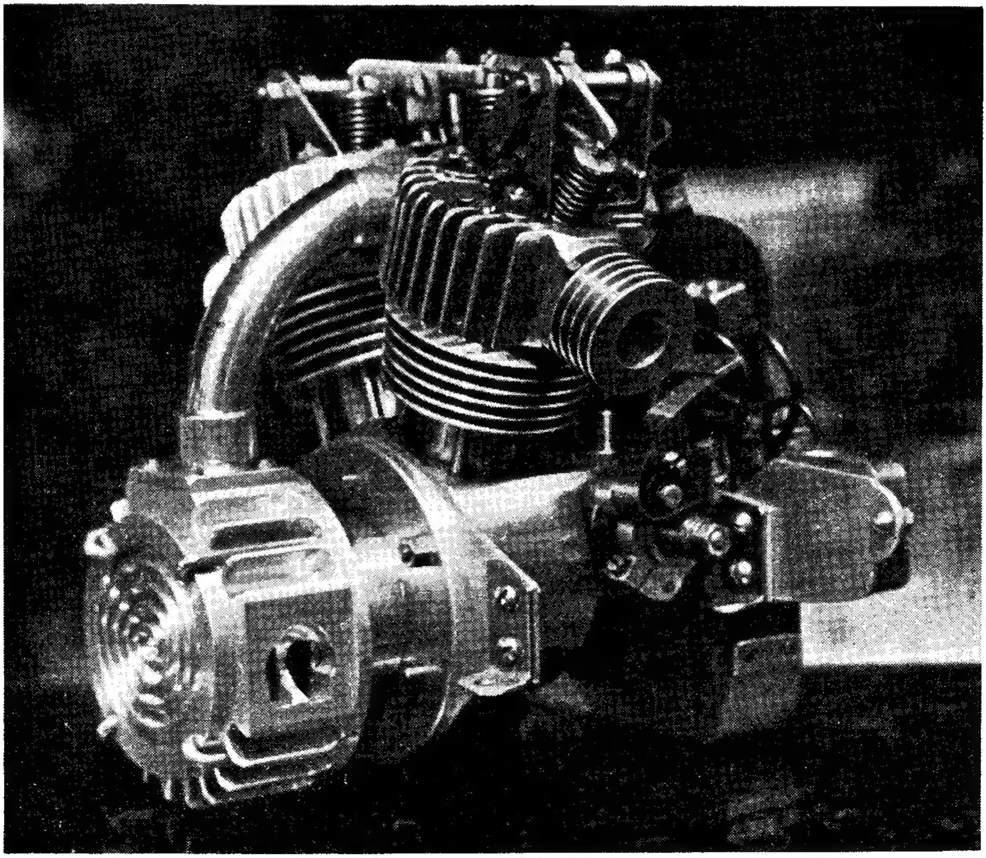
(1)	R. Phillips, S. London, *Foz II*	61.4 m.p.h.
(2)	W. Everett, Enfield, *Nan*	48 m.p.h.
(3)	A. Cockman, Victoria, *Ifit* 8	38.4 m.p.h.

300 *yd. Class "C" (Restricted) Race*

(1)	H. Poyser, Victoria, *Rumpus II*	37.9 m.p.h.
(2)	C. Stanworth, Sen., Bournville, *May*	37.2 m.p.h.
(3)	Mr. Pinchin, Blackheath, *Green Lizard*	26.2 m.p.h.

500 *yd. Class "A" Race*

(1)	S. H. Clifford, Victoria, *Blue Streak*	55.6 m.p.h.
(2)	E. Walker, Kingsmere, *Boxotrix*	50.1 m.p.h.
(3)	K. Williams Bournville, *Faro*	41 m.p.h.



Mr. Stalham's new vee-twin supercharged engine

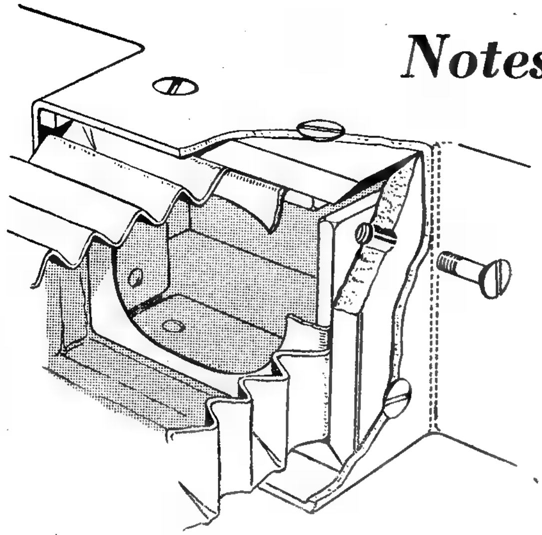


Fig. 7. Rear fixing of bellows and diaphragm

Notes on the Design of a 35 mm. Camera

by
Raymond F. Stock

THE excess leather at the front was turned in at the corners and trapped between the back of the lens panel and the front of a square plate inside the bellows: all three parts were then clamped against the back of the shutter by the lens ring.

At the rear end of the bellows the spare bellows material was clamped on all sides between four strips of brass and four strips of ebonite—each side being held firmly against the inside of the body by two countersunk screws, as shown in Fig. 7.

It will be seen that a diaphragm of thin brass was fitted at this point to reduce internal reflections from the bellows, etc. Its aperture was plotted out as a geometrical compromise between the exit diameter of the rear lens and the rectangle of the format so that it should closely approximate to the shape of the picture-forming rays at that point.

The right side of the camera body was fitted with a pressed cover concealing a tape measure marked out on a thin variety of domestic tape wound on a reel. This was divided with appropriate intervals to a total length of 9 ft., and terminates in a metal ring by which it may be hooked to any convenient point on the object photographed. For such close-range work it is a very great convenience and when copying drawings, prints, etc., the object is placed on the floor between the tripod feet with the camera tilted vertically downwards when the tape measure is allowed to hang down until the ring just touches the surface of the object.

A knurled knob is used to return the tape to its reel at the moment, but I intend to fit an automatic return spring when I get time.

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*Continued from page 240, "M.E.," August 23, 1951.

Mechanism

Such "mechanism" as the camera possesses is housed above the body under the top cover.

The film-wind knob (*ex*-Brown's headphones) was fitted on a short spindle passing through a bush in the top cover plate (which was bent up and soldered from 18-gauge brass sheet).

The end of the spindle terminates in the female portion of the simple coupling (referred to earlier) on the sprocket shaft, and the coupling carries a steel finger which intersects with a 12-tooth ratchet wheel forming the film counter disc. This was filed from a sheet of nickel alloy and engraved, after polishing, with the figures 1 to 12 around the upper face. One revolution of the winder-knob is required to advance the film by 1.5 in. (36 mm. picture width, plus 2.1 mm. margin) and this movement rotates the counter disc by 30 deg. so changing the number which is seen through a small bevelled-edge window in the top cover plate. The counter disc turns on a steel screw and was clamped between a fibre washer above it and a flat spring below to prevent it rotating accidentally. (Fig. 8.)

No. 11 on the counter was marked with a small red spot, and before loading the winder-knob is turned to make this spot visible. With full and empty cassettes in position the film is drawn across the focal plane, engaged with the sprockets and just entered into the right-hand (empty) cassette. After the back is closed the film wind is turned until No. 1 appears, which "absorbs" the wasted film and brings the first of the unexposed portion just opposite the picture aperture.

The winder-knob was hollow and I drilled the side to take a spring-loaded button (Fig. 9) which acts as a latch in conjunction with the stop on the body. This allows only one revolution of the knob at one time and permits winding

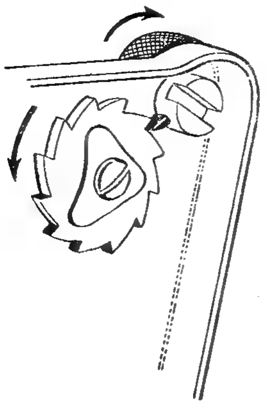


Fig. 8. *Counter mechanism*

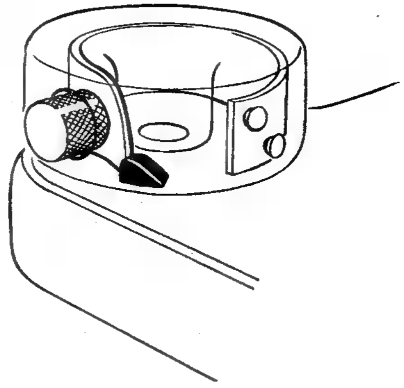
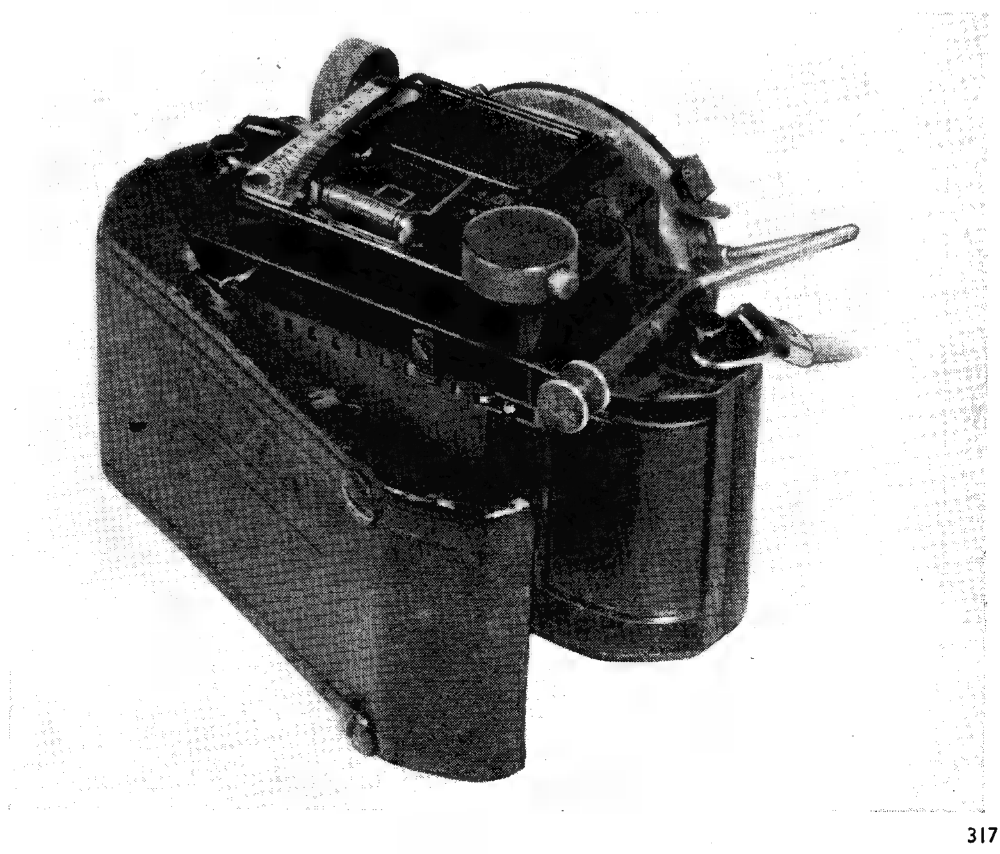


Fig. 9. *Film wind knob*

"blind." An obvious refinement would be to make this action interlocked with the shutter release [redacted] on many commercial cameras, but the problem is complicated when the shutter is carried on [redacted] movable part of the camera. I found the button described to be adequate as it is naturally depressed by the position of the fingers at the beginning of each turn but not at the end.

The focussing indicator was designed to give the best possible accuracy with the tools available, and though very simple has proved reliable; one amendment I would incorporate were I to reproduce the camera is to improve the scale length, possibly by [redacted] 360 deg. scale using [redacted] mechanism such [redacted] is found in a dial indicator.



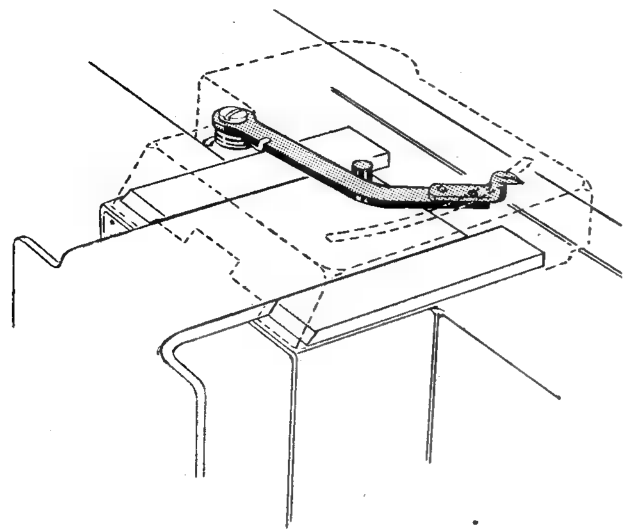


Fig. 10. Focussing indicator

springs which tend to keep both parts vertical, and proportioned the parts so that when lowered the front frame traps the tip of the rear plate and is itesif trapped by a lug on the top cover. Thus, during the initial "unfolding" movement of the camera, both parts of the finder are released and snap up into position.

The view seen through the frame coincides with the picture at infinity, and for practical purposes down to about 6 ft. or 7 ft. To eliminate parallax errors in close range work I bent up a small shield of brass which may be slipped over the top of the wire frame and slid down as far as any one of a number of coloured punch marks on the frame. These correspond to similarly coloured spots on the focussing scale, and when the shield is adjusted for any given distance the top of the field of view is limited to that which is correct for the distance. The bottom of the field is not, of course, indicated but is easily estimated and the system works so well that more complicated arrangements I have tried are not worth while. The shield is shown in Fig. 11.

As the shutter was not of the pre-set type it required more force to operate than was desirable. I therefore fitted an additional lever, having a fixed travel, to the shutter front plate, by which the normal shutter trigger could be depressed. The amount of travel was arranged so that the shutter is on the point of operation when the final movement is imparted by a flexible release.

In the mechanism fitted to the camera and illustrated in Fig. 10, the indicating lever was bushed at the end where it pivots on a hardened steel pin screwed into the camera body. The top arm of the lens panel has another steel pin which picks up the lever during its forward travel. It will be seen that the lens panel moves forward about ½ in. before the lever starts to move, and this first movement is simply a folding one to reduce the size of the camera. Fig. 1 indicates the relative lens positions when fully retracted, at infinity and fully extended for focussing to 18 in.

A spring around the pivot bush tends to urge the lever to the rear and thus keeps it tight against the pin. The lever terminates in a riveted nickel alloy tip cranked to pass through a curved slot in the top cover, where the tip runs just clear of the focussing scale.

The view finder was made up on the open frame principle, as I always prefer this type to those optical devices which (to me) simulate the effect of using the wrong end of a telescope.

The finder has two parts: a 16-gauge steel wire frame, 24 × 36 mm., hinged to the lens panel and lying directly above the optical centre of the lens; and a sheet brass plate having a $\frac{3}{16}$ in. square hole, hinged to the top cover and lying vertically above the focal plane. Thus the front element moves with the lens and reproduces in the finder the alteration in the angle of view which is actually occurring inside the camera. (See Fig. 11.)

I fitted the two hinges with

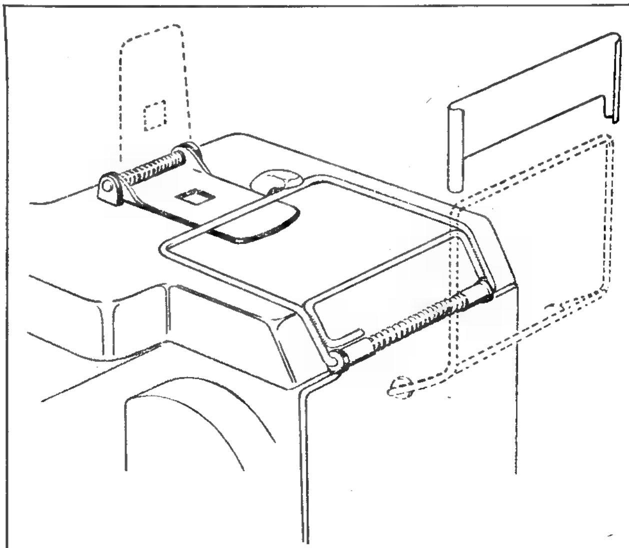


Fig. 11. View finder and parallax adjustment

This fits into the slotted holder on the body for normal operation, but may be removed and used in its proper fashion for tripod work.

Finish

The various parts of the camera were all stoved black (in the domestic oven) and given [redacted] coat of really matt black inside, the pressure plate being blackened chemically.

The body and back were then covered on their vertical surfaces with more leatherette from the box camera which supplied the bellows, glued on with Croid. This was by way of [redacted] experiment but although the edges of the leather were not protected in any way there has been no sign of peeling after more than three years of use. This glue was also used for the bellows.

A small detail that gave [redacted] more "professional" appearance to the job, was to emboss a name on the back, and the effect may be seen in one of the photographs.

The letters were cut from thin card and glued to the back of the leather (in reverse !) and after sticking on the leather a rounded tool was used to trace around the edges of the letters, which then appeared in relief. This was done while the glue was still tacky.

Calibration

With the rest of the camera completed the focussing scale was made. The scale, of polished aluminium, was screwed in place and a slip of finely ground glass (made more translucent with petroleum jelly well rubbed in) was clipped in the focal plane.

The calibration marks at the selected distances were then scratched on the scale with a needle, opposite the pointer, each distance being carefully focussed with the aid of a magnifying glass.

This process is an obvious one but is harder than it appears. One requirement is a reasonably clear day, and I found the local grid system an admirable object for focussing "infinity." The grid wires ran at an angle to the line of sight and by tracking the camera along them it was possible to find [redacted] point at which the wires themselves were only *just* visible at the point of correct focus. This point was obviously easier to find than one where the wires were most sharply defined.

The same principle was applied to focussing at closer ranges, and test objects—sheets of newsprint—were set up at measured distances. I then used, wherever possible, the size of type which was just readable when accurately focussed.

After calibration the needle scratches were made deeper and filled with Indian ink, and the scale of distances screwed over the aluminium strip. This scale was made by lettering the figures, leader lines, etc., on Bristol board and sandwiching the board between sheets of celluloid. Balsa cement was used as the adhesive, and the sandwich dried under pressure, being cleaned up to exact size when dry. This, incidentally, is a very useful method of making similar scales and dials since it has a good appearance and is very durable, the lettering being safely buried in the plastic.

With the camera finished I found a test film to be an interesting confirmation of the calibration. I made 12 exposures (at full aperture, to give *minimum* depth of focus) of selected test objects set at known distances, the camera being focussed according to the scale. Prints of the negatives were examined to determine whether the test objects were, in fact, the sharpest planes visible, or whether some plane in front of or behind the test object was clearer.

Conclusions

After using the camera in varied circumstances for 3½ years I find it quite satisfactory as the *minimum* apparatus required for successful 35 mm. photography.

Design points that I would modify if remaking it are, in this order :—

(1) Focussing scale should be expanded to at least 4 in. ; this would naturally follow if a helical focussing mount were adopted.
(2) Incorporation of a coupled range finder.
(3) Provision of [redacted] shutter with faster speeds.
(4) The design and construction of a new type of combined range finder and optical viewfinder to give a large easily seen picture.

Camera Construction

Mr. Matthew J. Morrison writes :—"I have followed this discussion with the keenest interest, and I am sure we are all indebted to Mr. Todd for having started it, and I for one am looking forward to his proposed design."

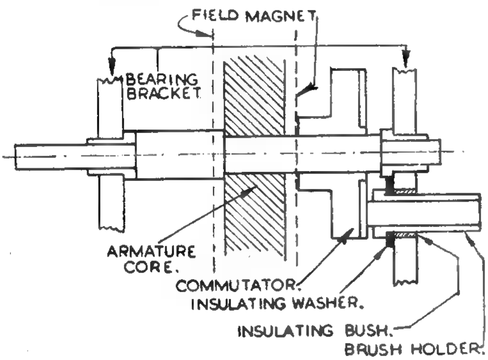
"There is one little dodge I use which I have not seen mentioned yet, concerning the actual exposure, in photographing models, etc., which I would like to pass on to the advocates in the 'Shutter versus lens cap' controversy. For small objects, document copying, etc., I [redacted] neither, but arrange everything in the dark room with the camera firmly clamped, and focus sharply using the flood lights, then stop down the lens, replace the focussing screen with [redacted] loaded dark slide, leaving the shutter *open*. The lights are then switched off and the slide of the plate holder withdrawn ; the exposure is then made and timed by means of the flood light switch, *remote* from the whole set-up, thus eliminating vibration of shutter, or contact with the lens. I do not know if this is original, but I have used it for years for this class of photography with complete success, and it certainly overcomes the problem of rigidity (or lack of it) which is just [redacted] important as [redacted] lens hood, or backed plates, in securing the clear crisp negatives, necessary with this type of photography."

*A Chiming Gear
for the Battery-Driven Electric Clock
by C. R. Jones

I THINK, and hope, that the drawing below makes the assembly of the spindle, bearings, armature core, commutator and brush holders, etc., quite clear.

Field Magnet Assembly

This drawing is mainly to emphasise the fact that the two magnets must be fitted with like poles at the top and like poles at the bottom. It also shows the recesses for the magnet ends before mentioned.



SPINDLE ASSEMBLY.

The base shown is merely a piece of brass, 1 in. in diameter and was made of such a thickness to bring the spindle of motor up to the right height to enable the worm to mesh properly with its mating reduction gear. This was screwed to the bottom of the field magnet with two 6 B.A. countersunk screws.

Winding the Armature

The armature was wound with 100 turns of No. 30 silk-covered copper wire on each limb, thin paper insulation being stuck on first. Each limb was wound in the same direction, the finish of one coil being joined to the start of the next in each case. The ends were cleaned and twisted together and then soldered to make a good electrical join.

The commutator was then pressed on in its proper position, which is with the slits in the copper part in line with the centre of each limb of the armature core.

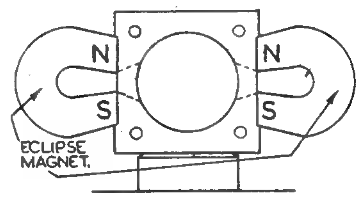
The ends of the windings were then soldered carefully to the segments of the commutator.

The brush holders were insulated from the bearings brackets by means of small insulating bushes turned up from ebonite and also insulating washers where shown on spindle assembly drawing.

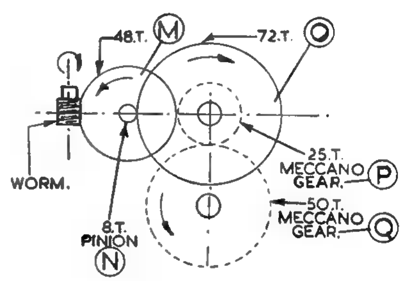
The brush holders were simply pressed in, and no other fixing was deemed necessary.

The brushes and their springs were retained by short No. 3 B.A. grub-screws, the ends of the brush holders being tapped with a few threads to receive them.

The direction of rotation of this motor is shown



FIELD MAGNET ASSEMBLY.



GEAR TRAIN.

by the arrows on the drawings, and if it runs in the wrong direction, can be easily reversed simply by changing over the battery connections.

No attempt has been made to fix the magnets to the field poles as they seem to stop in position without, but these can be fixed if it is thought necessary, with a couple of *brass* straps held on with small screws.

To position the magnets correctly, hold the two ends together and turn them round until they *repel* each other, then place them in position without altering the relation of their poles.

Great care should be taken to see that no iron or steel filings get between the armature and the field magnets, as these will be sufficient to stop the motor rotating, or at least slow it down considerably.

**Continued from page 250 "M.E.," August 23, 1951.*

If the motor has been carefully made and assembled, it should be self-starting and have quite a fair amount of power, when the two brush holders are connected to two or three volts.

I got quite a lot of help in constructing this motor from the Percival Marshall handbook *Small Electric Motor Construction.*

Gear Train

After completing the motor it became necessary to gear it down in order to drive the chime drum at a suitable speed to operate the chimes, and the gearing shown on the drawings and photographs has proved quite satisfactory for this purpose.

The gears used in this case were not made specially, but were found in the junk box and brought into use.

It is not proposed to go into the making of gears for this chiming gear, as the sizes and number of teeth are given on the drawings, and any suitable gears, which give a reduction of about 450 to 500 to 1 should be suitable.

It will be noticed that in the present case the wheel (*M*) has a spigot bearing which runs in the bearing bracket (*R*).

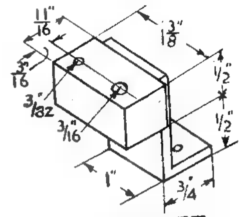
The wheel (*O*) is bushed and is pressed on to the chime drum spindle (*S*) as shown in the view of "The right side of mechanism."

This wheel meshes with pinion (*N*), which in the present case has eight leaves.

The wheels used in my chiming gear appear to be 48 diametrical pitch.

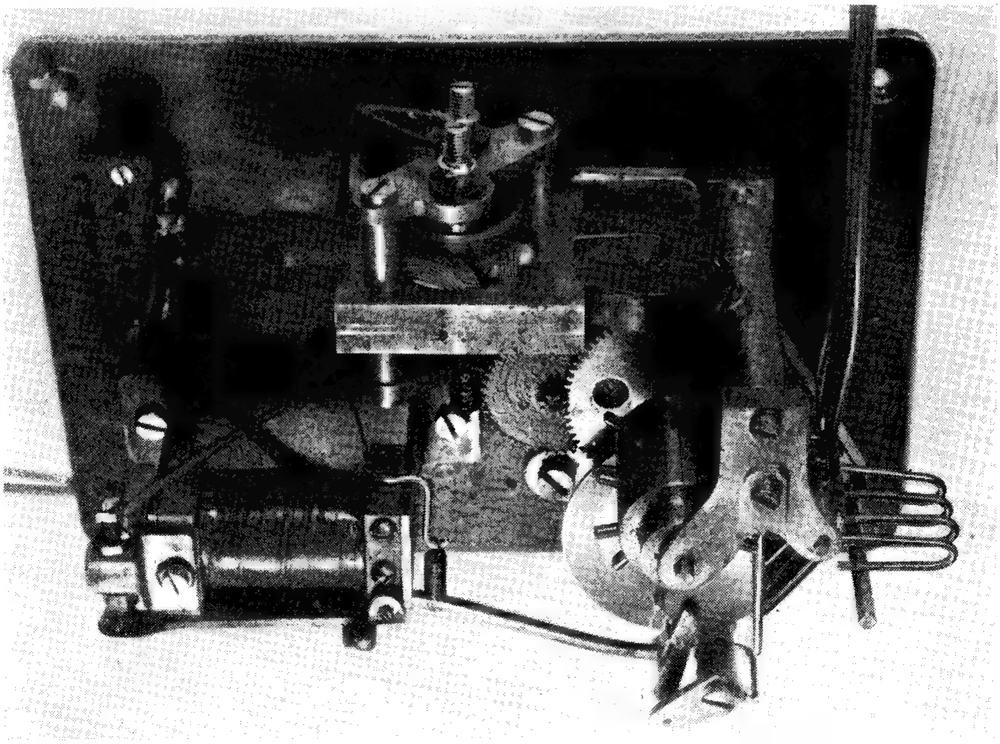
Bracket Bearing

This was used to accommodate the wheels used, and consists of a small block of cast-iron screwed to a piece of angle-iron as shown. The

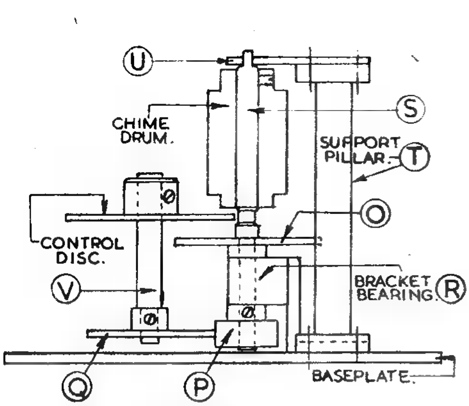


BRACKET BEARING.
(R)

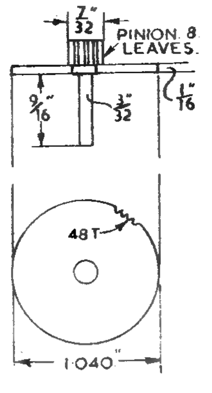
wheel (*M*) was raised slightly from this by a small brass washer as shown, the lower end of the chime drum spindle protrudes through the bracket bearing to accommodate the smaller gear of the two-to-one reduction gear to the control disc.



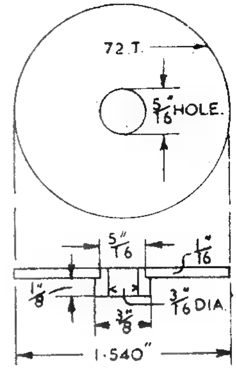
Photograph No. 4. View from top looking down



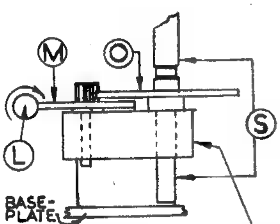
RIGHT SIDE VIEW OF MECHANISM.



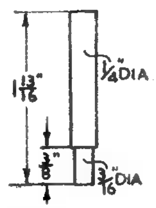
WHEEL (M) & PINION (N)



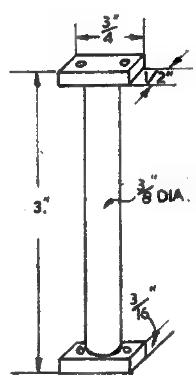
WHEEL (O).



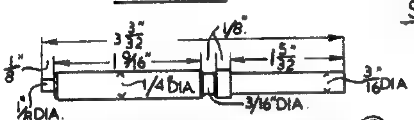
BRACKET BNG. (R) & REDUCTION GEARS.



CONTROL DISC SPINDLE.



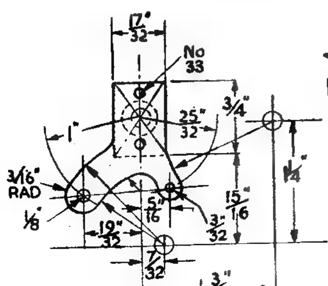
SUPPORT PILLAR



CHIME DRUM SPINDLE (S)

Half Speed Reduction Gears

These as shown on the drawing of the gear train, are two "Meccano" gears, the smaller with 25 teeth, and the larger with 50 teeth. These gears were set up running true on the outside diameter, and were bored out with a small boring tool to $\frac{3}{16}$ in. diameter to fit on their spindles, as shown on the drawing of "The right side view of mechanism."



TOP BEARING FOR CHIME DRUM.

Chime Drum Spindle and Control Disc Spindle

These spindles were made from $\frac{1}{4}$ in. diameter silver-steel, to the dimensions shown on the drawings.

Support Pillar

This was turned up from $\frac{3}{4}$ in. $\times$ $\frac{1}{2}$ in. flat mild-steel to the dimensions shown, and supports the top bearing, and also the hammers.

Top Bearing for Chime Drum

This was made from $\frac{1}{16}$ in. thick brass to the dimensions shown, and was attached to the top of support pillar by means of two No. 6 B.A. cheese-head setscrews.

(To be continued)

*TWIN SISTERS

by J. I. Austen-Walton

Two 5-in. gauge locomotives, exactly alike externally but very different internally

IT has been great fun following out my own advice on how to assemble the cylinders and valve-gear on the frames, and this I had to do recently, just before the long-awaited air test. It would be easy for me to say that everything went according to plan—nobody would know otherwise ; but it *didn't*, not by a very long chalk. Let me relate the whole story.

I got as far as getting the cylinders working well as separate units, that is, free running on compressed air, but as soon as the guide bars and motion plates were fitted, I ran into trouble straight away. The thing that baffled me for quite a long time was the fact that I had had all these parts together on a previous occasion, and then, everything had worked as smoothly as silk ; I gained the impression that every time I took the thing to pieces and rebuilt it, there was a distinct difference somewhere, usually in the form of an increased stiffness that was rather hard to locate. This worried me for some time, but at last I took the entire bag of tricks to pieces, laid out the offending bits of metal on the bench, and sat scowling at them for about an hour.

A Fresh Start

What a valuable expedient this was ! In spite of all my original care in the making of the parts, I found at least half a dozen things that, although minutely small, had probably been the cause of slight trouble somewhere. There were a couple of studs with not quite enough thread, a nut with hardly any thread at all (goodness knows how *that* came to be used), and an odd flake of metal squashed in between two of the guide-bar shims.

So much for the foreign bodies and defective parts. I found also that a union link was bent, a combination lever had become twisted (probably in the flute-cutting operation), two pins had become extremely tight in their bushes, due, no doubt, to their shrinking in the bore after reaming. Before passing over this point, it is a fact that bushes squeezed into levers *can* continue to contract for quite some time after, and it is a good plan to ream again after some time has elapsed. Last of all, there were some actual mechanical interferences ; one of these was between the combination lever and the oil box on the crosshead—a few wipes of the file on the side of the box did the trick. Another, and a more serious, defect showed up in the valve guide block to combination lever pin, and I found that the head of the pin fouled the top surface of the radius-rod when the piston was at its extreme forward stroke. The remedy here was to fit a completely flush pin, riveting over on the back of the fitting ; it makes the valve guide block and the combination lever a more or less permanent assembly, but this does not matter at all.

I made one other discovery ; one of the back cylinder cover gaskets, a reputed 1/32 in. thick sheet material, was very far from being a uniform thickness, and this had thrown the guide-bar fixings out of line, and to quite a measurable extent, but I was lucky enough to spot it and replace it with a new gasket, cut from a new sheet altogether.

And so the whole job went together again with an eagle eye watching every pin and piece for possible errors ; but I suppose the offending items had been discovered this time, because when the air was at last turned on to each unit, it worked perfectly.

Moral ? Yes, of all the nerve-wracking, exasperating things that were ever invented, small locomotives just about take the entire cake —bless 'em !

Progress Report

As to the other, and more recently described parts of the motion, here are my findings :—All dimensions given, worked out right ; even the length of the eccentric-rod came to within a few thousandths of its theoretical length on one side, but was plus a little on the other ; this, I think, was due to a slight variation in the position of one of the motion plates, and was in no way serious.

Whilst on the subject of the eccentric-rod I must mention that when I came to look out some material from which to make these, I could not find any of the $\frac{7}{16}$ in. thickness required for the widest part of the rod, namely, the front fork-end, so I made it from $\frac{3}{8}$-in. bar. It certainly looks very well, and others may make this variation if they so wish.

The little return crank setting jig, did the job to absolute perfection, as was proved when the valve setting was done—I am quite pleased about this, as it does lay a very nasty bogy fairly and squarely by the heels.

And the actual compressed air test—an exciting moment this was. Everything was jacked up, including the wheels to their correct running positions, and in case you have forgotten the positions, they are :—leading and driving, $\frac{3}{16}$ in. between the bottom of the axleboxes and the keep plates ; trailing, $\frac{1}{4}$ in. between bottom of axlebox and *top edge* of keep. To achieve all this, I drilled and tapped a 5-B.A. hole in the centre of leading and driving keeps, and fitted a temporary stud that would project through the

**Continued from page* 140, " *M.E.*," *August* 2, 1951.

keep to the exact amount when fully screwed up; I could not do this in the case of the trailing pair, so I turned up a couple of bits of $\frac{5}{16}$ in. dia. rod, about $\frac{5}{16}$ in. long, and cut a slot $\frac{1}{16}$ in. deep, across one end; the slot was to straddle the edge of the keep, to prevent it slipping out—anyhow, it works quite well as a temporary measure.

When first I turned on the air, nothing happened; there was certainly no escape anywhere, and no blow past valves or rings, and then I did a silly thing—I gave the trailing wheels a slight help—I thought that most of the right-hand first finger had gone, but actually I got away with a black nail and a frayed temper. I ought to know better? Of course I should! Why do we ever do these daft, silly things?

Oh, Lovely Vision

Quite ignoring the unpleasant part of the proceedings, "Twin Sister" No. 1 was turning round pleasantly and happily; her beats were a bit out, and there were "lumps" here and there. I had given her a preliminary valve setting in the rough, and it was now obvious that "rough" was the operative word. But the blessings of original forethought were coming back now, and in a matter of minutes (or perhaps, seconds) the valve chest cover plugs were out, and I could watch valve events in perfect clarity and comfort, whilst the nutted valve spindle-rods could be adjusted with equal speed and ease.

It was not very long before I had her running with perfectly even beats—forwards *and* backwards, and loads of power all round. For the benefit of those who have never before reached such a stage of satisfaction, here are some more snags that might worry the novice, or even the fairly experienced man. To start with, compressed air does not give the same reactions as steam; this is due to the fact that there is no great expansion in it, especially when fed to the engine at a comparatively low pressure. I was using a blower-type compressor which has a ceiling pressure of about 10 lb. (enough for blowlamps and black nails), and at that level, air is as dead as a door nail. Now this locomotive has quite a fair amount of lead, and on compressed air it gives the impression of a slight "lump" at the end of each stroke. The cylinder that is in the expansive working stage normally more than covers the end of stroke compression on the other side; but as there is no real expansion on air working, anything after something around 50 per cent. cut-off is practically dead working, and the lumps are felt quite plainly.

And then there are other "lumps." Before putting the chassis on air for the first time, it is usually considered good practice to oil up all round, and to put a fair amount of oil down the steam pipe, to look after the cylinder and slide-valve parts. A fair amount of this oil settles in the bottom of the cylinder, and is never entirely expelled, even at the end of the stroke. I met one such lump which, at first, I thought was some slight remaining error in the setting; I had fitted the cylinder drain cock holes with temporary screwed brass plugs, and after these had been removed for a few moments whilst the engine was working, not only did a lot of most "un-oil-like" substance come out, but the "lump" disappeared entirely.

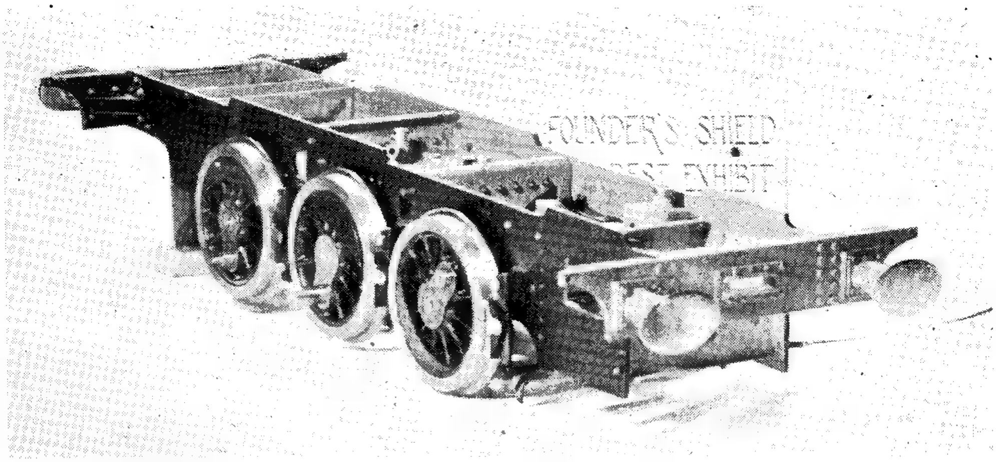
Whilst on the subject of lubrication, I might add that I made use of my old and trusted friend—colloidal graphite, which was mixed with all the oil I used in the initial stages; engines fitted with cast-iron cylinders, pistons or rings, definitely take kindly to the finely-divided colloid graphite, and this seems to sink into the rather open pores of the cast-iron and, what is more important, to stay there.

In normal working conditions, any solid substance of such a kind, mixed and suspended in oil, is liable to settle and block up fine oil ways in mechanical lubricators, especially where the oil becomes hot and very liquid, and can no longer maintain the viscosity to support the fine particles of graphite. But the initial baptism of the running-in compound should do its useful work when the engine is in its bench-testing stage, and most builders should make an effort to carry out such running for as long and continuously as possible.

There is still another side to this, quite apart from the lubrication and running-in angle. I noticed that my final "correct" valve setting, after about ten hours' running on the bench was still not above reproach; in other words, she was settling down in other ways, which is normally to be expected. I would much rather get this settling-down business over and done with on the bench, than try to make red hot, and therefore rather hasty adjustments when the job is having its first steam test—perhaps on the track into the bargain. I shall never forget how unkindly certain people spoke of "Centaur's" unfortunate first day out; it seemed to be forgotten that she was taken straight from the exhibition stand, and in which state she had never had a complete steam test, but her performance since then has more than made up for that. Thinking back over these things the other day, I realised that, since she was built, the following records are still to be broken; never once has the fire failed to go the first time of asking; never has the fire died on me, or on any of her drivers; never has she failed to start and carry on with any size or kind of load put behind her, never failed with a big load on a freak gradient, and the kind of "freak" gradient I have in mind was in the nature of about *one in ten*. No doubt many others can equal this, if they care to think back, and I point it out to demonstrate how very reliable the average locomotive is, and how little else one could reasonably expect of it.

Another Success

Our picture this week shows a view of Mr. William E. Whitely's "Major." In a letter to me, he tells me that when he exhibited it at the Keighlly Exhibition, on July 7th, he gained first prize in its section, a bronze medal, and the Silver Shield for the best model in the show! We have had one other bronze medal winner to date, for an unfinished "Major," but this is the first case reported where the builder seems to have walked off with everything. Bravo, Mr. Whitely! The thing that pleases me more than anything else is the rising standard of workmanship in this particular field, and may it continue.



Mr. Whiteley's prize-winning model chassis for his "Major"

Business as Usual

This has a double meaning, at least for me. Once more fate stepped in and whisked my good lady away for an operation for appendix removal, and building locomotives and keeping house do not go well together. She is now home again and recovering well, thank goodness. I hope to get on with my interrupted work on the drawing board, and to have more drawings in the next instalment; there are plenty of parts for you to make, and very soon now you will be able to say, "That's the chassis finished."

(To be continued)

Brighton's Festival of Model Engineering

ONE of the largest exhibitions of models of all sorts and sizes was successfully staged by the Brighton and Hove Society of Model Engineers at the Corn Exchange, Brighton, from August 4th to August 11th, 1951. Down the centre of this very large hall ran two multi-gauge railway tracks on which over a dozen locomotives were engaged throughout the show hauling passengers of all ages.

At one end of the track was erected a model-maker's workshop complete with all the impedimenta of an engineer's shop, including lathes, drilling machines, hacksaw machine, benches, etc., in which members were engaged at work. During the exhibition, a complete passenger truck for use on the society's track in Hove Park was constructed. All the tools in use were temporarily removed from the society's workshop in Goldstone Street, Hove.

Another feature that drew a continuous crowd of interested visitors was a tableau of models illustrating the pageant of the Brighton Road, possibly one of the most famous roads in the world, including vehicles of all descriptions from the chariots of the Romans to the latest type cars and coaches, and with representative gigs and coaches of the Regency period.

The marine side was also well represented including a brand new 4 ft. model of the cross-channel steamer *Invicta*.

There was a wonderful display of models of Sussex buildings by that well-known expert in this form of model-making, Mr. George Clasby.

Elsewhere in the exhibition models of every description were seen in motion, and watching the "wheels go round" proved a great fascination to the thousands that entered the hall.

The exhibition was opened by the Mayor of Brighton assisted by the Mayor of Hove, and the prizes were presented on the closing day by Mrs. Clarke, the wife of Councillor C. A. Clarke, president of the society.

Numerous trade stands were kept busy during the week and reported excellent business, and the new members sheets, placed in a prominent position on the information table, was filled with names and addresses, which means that there will be considerable new "blood" in the immediate future.

IN THE WORKSHOP

by "Duplex"

No. 97—An Adjustable Holder for the Test Indicator

FOR use on the surface plate or on the lathe bed, the test indicator is, perhaps, most often mounted on the pillar of the surface gauge so that both a coarse and a fine adjustment for height can be readily made. On the other hand, some workers attach the indicator to a stand, having a pillar fixed to the base, like that illustrated in Fig. 1. It so happens that an "Eclipse" stand with magnetic base has been much in use recently, owing to the convenience afforded when taking readings with the test indicator in awkward places. When the test indicator is mounted in this way, the height setting is made either by sliding the instrument as a whole on the pillar or by rotating the attachment bracket; but in either case, a means of making fine adjustments is lacking. To overcome this difficulty, the adjustable mounting, here described, was made up and has proved very convenient in use. As will be seen, at one end the body of the device carries a short, detachable spindle for attachment to the pillar clamp, and at the other end a second spindle serves for mounting the clamp bracket fitted to the indicator itself. This second spindle

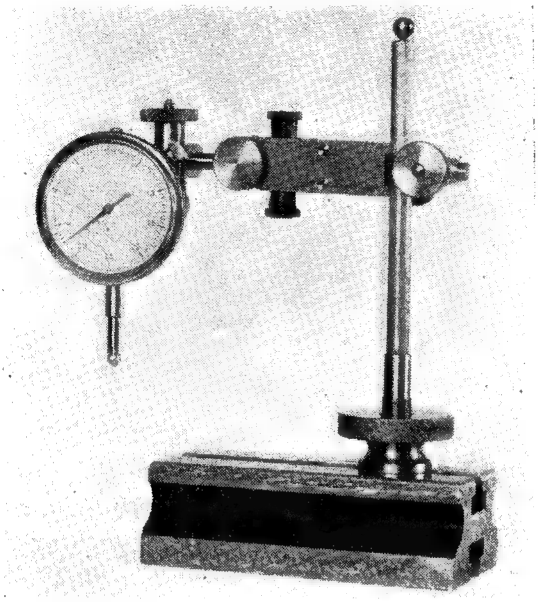


Fig. 1. The test indicator mounted on the adjustable holder

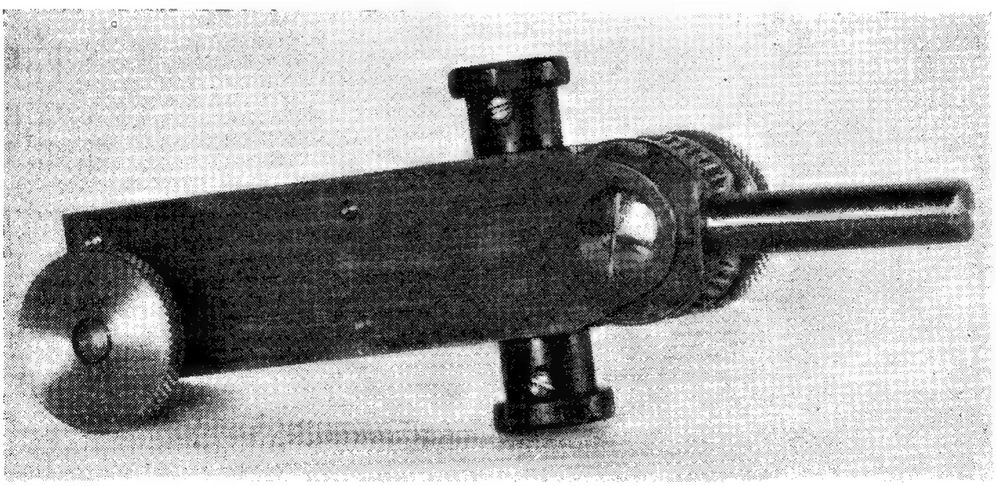


Fig. 2. The adjustable holder

lettered *K* in the drawings, is secured to a worm wheel, so that, when the worm wheel is rotated by the worm shaft, the test indicator will rise or fall accordingly. It is true that the contact point of the indicator will move on a circular path as adjustment is made, but in practice the effect of this can be largely offset by setting the indicator a little above the work, so that the contact spindle of the indicator comes to lie vertical when the final adjustment has been made. Following this, the locking screw is tightened to clamp the moving parts securely.

The two small finger-wheels (*F*) can be made of either metal or plastic material, such as bakelite rod. The worm wheel is, perhaps, best made of steel, and afterwards case-hardened to resist wear. The wheel blank is turned to approximately $\frac{3}{4}$ in. outside diameter, for there is no need to consider the pitch diameter, or the exact full diameter, as the teeth required to engage the worm shaft occupy only a portion of the periphery, and a thick or a thin tooth in one place can be removed when the flat for the mounting spindle is formed. As illustrated in

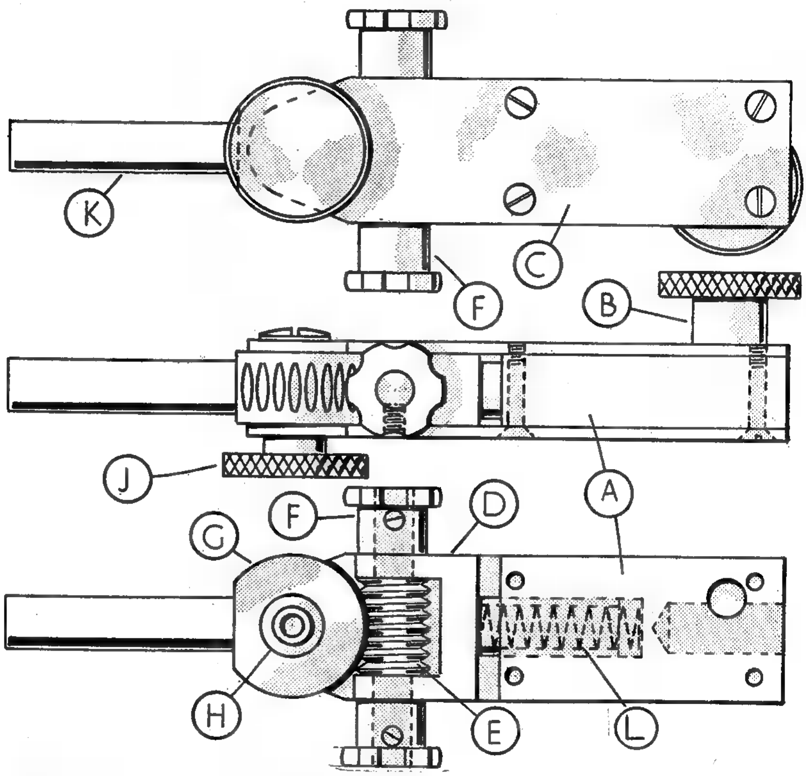


Fig. 3. "A"—the body; "B"—the clamp cotter; "C"—the side plates; "D"—the worm shaft fork; "E"—the worm shaft; "F"—the finger wheels; "G"—the worm wheel; "H"—the worm wheel spindle; "J"—the locking-screw; "K"—the mounting spindle; "L"—the worm fork spring

The two mounting spindles referred to will, of course, have to be made to suit the particular indicator and the clamping brackets used. The worm shaft is kept in engagement with the worm by means of a concealed spring pushing forward the forked mounting of the worm shaft.

Construction

Little need be said of the actual construction of most of the parts, as this should be made clear by the detailed drawings, but a few notes on making the components of the worm drive may possibly be found helpful. The worm itself (*E*) is merely a short length of rod, threaded $\frac{3}{8}$ in. Whitworth standard, and reduced in diameter at the two ends to fit the worm fork (*D*).

Fig. 5, the wheel is next mounted on a well-fitting spindle attached to a bar for gripping in the lathe toolpost. With the lathe running at slow speed, the wheel will start to revolve when brought into contact with the threads of the tap; the work is then carefully fed forward until the wheel teeth are formed with a sharp crest.

During the machining, a plentiful supply of cutting oil should be fed to the tap with a brush. As already mentioned, inspection of the finished wheel may show that an irregularly cut tooth has been formed at the point where the teeth meet, if so, this is the place to select for filing the flat shown in the drawings. After the wheel has been case-hardened, all surfaces should be well cleaned with a wire brush or by using the sand-

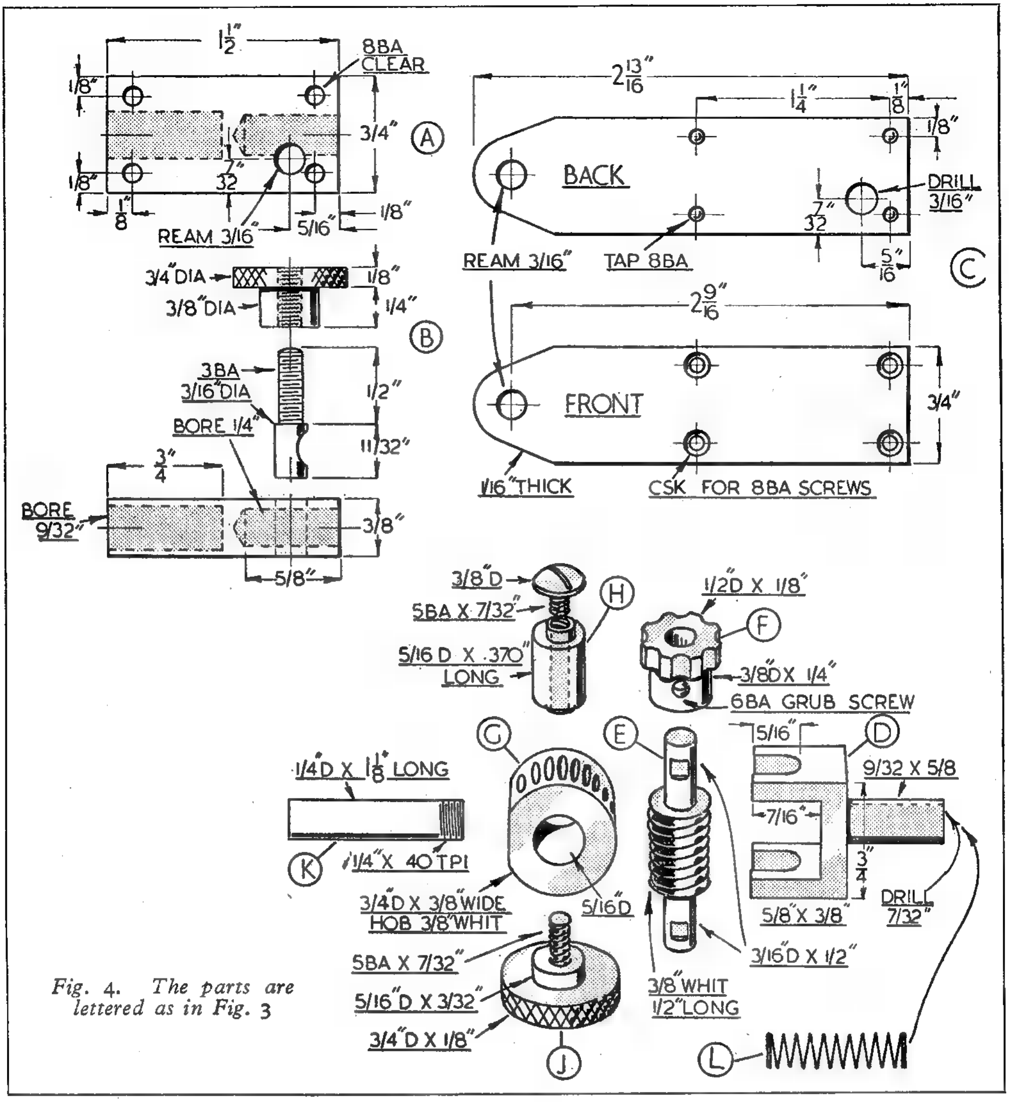


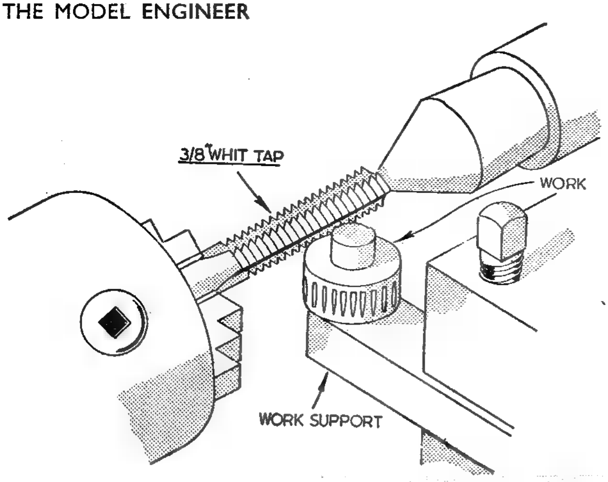
Fig. 4. The parts are lettered as in Fig. 3

blast, and the bore must also be freed from scale so that the wheel can turn freely on its spindle. The assembly of the parts should present no difficulty, but the worm shaft fork must be made a free sliding fit in the body, to enable the spring to keep the mating teeth in firm contact. In addition, it is essential that the knurled finger-wheel should clamp the worm securely.

The Internal Contact Attachment

The test indicator is often required for taking a reading against a overhanging shoulder, or within a bored hole when setting a component to run truly in the four-jaw chuck. For these purposes, a lever attachment is fitted to the indicator, and the free end of the lever can then be used to make contact with the work. As will be seen in Fig. 6, a horizontal bar is clamped at one end to the indicator itself, and at its other end the bar carries a hanger for supporting the contact lever. This lever is pivoted in the hanger on trunnion screws to allow of free turning movement. When the appliance is clamped in place, it will be seen that one ball-end of the lever makes contact with the contact point of the indicator, and the other ball is conveniently placed for bearing on the work.

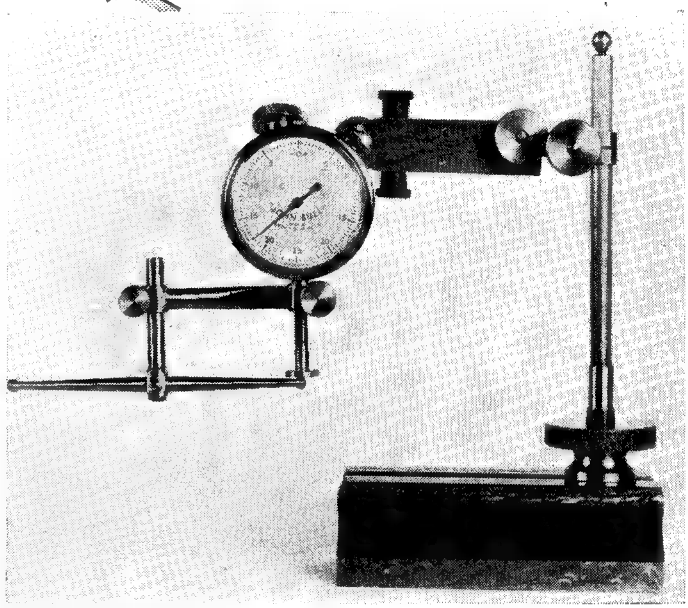
If the two limbs of the lever, on either side of the pivot, are made of equal length, the readings taken against the work will correspond with the scale readings of the indicator, but the movement will, of course, be in the reverse direction.



Above—Fig. 5. Method of hobbing the worm wheel in the lathe

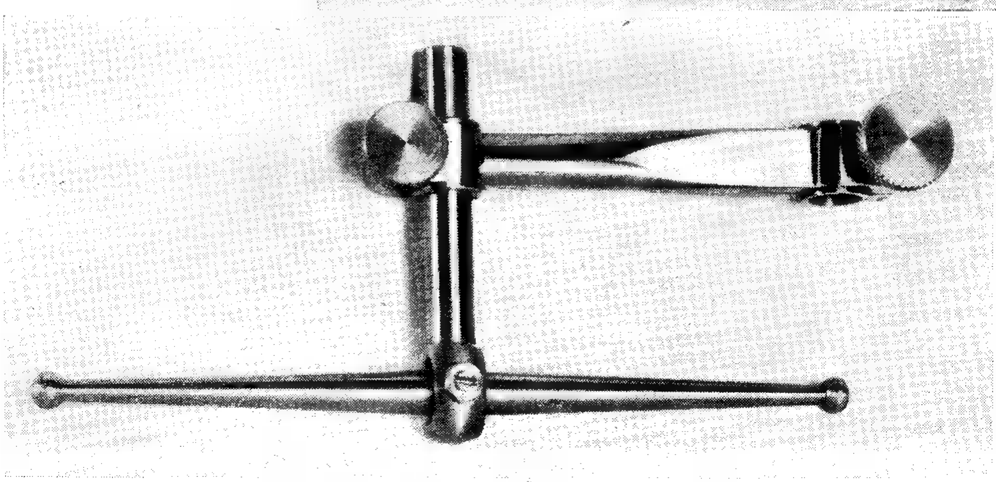
Construction

Perhaps the points needing most care are to ensure that the ball meets the centre of the indicator contact when the lever is in the horizontal position; also, the fitting of the lever pivots must be accurately carried out to give free but shakeless working. When making the lever, a straight piece of 7/32 in. dia. silver-steel rod is cut to length and set to run truly in the four-jaw chuck with one end projecting for about ½ in. After the end of the work has been reduced in diameter, the ball is formed either with a hand-graver or by using the ball-turning



Right—Fig. 6. The inside contact attachment mounted in place

Below—Fig. 7. Showing details of the attachment



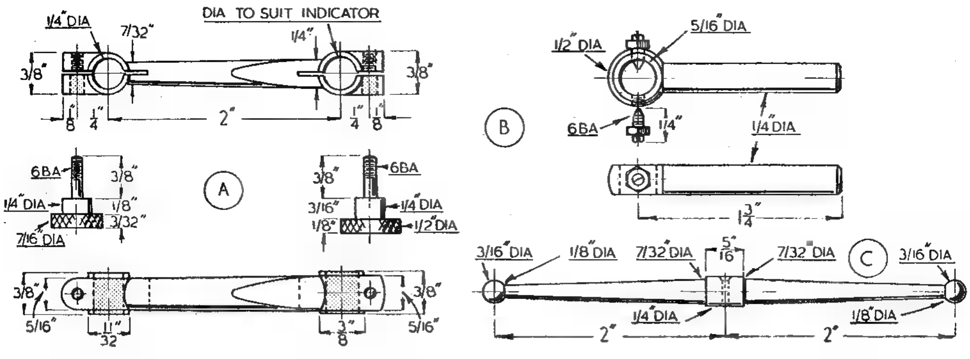


Fig. 8. " *A* "—*the bar* ; " *B* "—*the hanger or banjo* ; " *C* "—*the ball-ended lever*

attachment. The second ball is then machined in the same way. Next, the lever is secured in the cross-drilling jig for drilling a 1/16 in. dia. hole right through at the exact centre point of the length. The two ends of the cross-hole are then lightly countersunk with a small centre drill. To form the tapers on the lever, the part is again gripped near its centre in the four-jaw chuck, and the ball-end is supported in a recessed tailstock centre. A female centre for this purpose can be improvised by gripping a short length of brass rod in the tailstock drill chuck and then feeding a 90 deg. countersink, held in the mandrel chuck, into the end of the rod until a recess is formed of sufficient depth to support the ball. Finally, with the work supported in this way, the top slide is set over and very light cuts are taken at high speed with a pointed tool to machine the two tapers to the form shown.

The hanger, or banjo, for carrying the ball-ended lever is made from a length of 1/2 in. dia. round steel rod, and, after being marked-out, the material is drilled with a 5/16 in. dia. hole when mounted in the cross-drilling jig ; at the same time, the holes to receive the pivot screws are drilled and tapped.

The work is next gripped in the chuck, so that the shank of the banjo can be turned to 1/4 in. dia. ; then, with the work reversed, the head of the banjo is parted off to length and finally turned to roughly sperical form. To finish the part, the sides of the ball-end are either filed flat or, if preferred, these surfaces can be machined by mounting the work on a stub mandrel.

The remaining part, the beam for carrying the hanger and mounting the appliance on the test indicator, can readily be machined and filed to shape from a length of 3/8 in. square mild-steel.

For the sake of appearance, the two ends of the beam should be slit with a narrow, circular slitting saw while the work is clamped in the lathe toolpost. When the internal contact attachment is used it is advisable to fit a flat or slightly curved contact on the spindle of the test indicator, for this will afford the ball-ended lever a good bearing surface, even if the lever is slightly tilted.

For the Bookshelf

The " M.E." Lathe Manual, by E. T. Westbury. (London : Percival Marshall & Co. Ltd.) 160 pages, size 5½ in. by 8½ in. Price 12s. 6d.

As is to be expected from such an author as Mr. Westbury, this book is essentially practical, informative and instructive, obviously based on many years of experience with lathes of various makes, and it deals exclusively with the specialised subject of the metal-turning lathe as used in light general engineering practice.

There have been many books in the past dealing with the lathe, its uses and capabilities ; but this one is unlike any of them, for Mr. Westbury understands the requirements of his readers and lays the principal emphasis of his text upon explaining the reasons for the main features of lathe design and modes of procedure.

The book is profusely illustrated by line drawings and halftones, carefully chosen to aid the reader to understand and appreciate the advice and information given in the text. One very striking feature of the illustrations is that they show almost every known lathe operation being carried out on the lathe *as it is*, not with the aid of multifarious " attachments."

Models in Bottles, by R. F. C. Bartley. (London : Percival Marshall & Co. Ltd.) 93 pages, size 5 in. by 7½ in. Illustrated. Price 9s. 6d. net.

Perhaps, in these enlightened days, the problem of how the model ship got inside the bottle is not so much of a mystery as it used to be. The popularity of this kind of model, as a pleasant pastime, has increased of late, and more examples are met with than ever before.

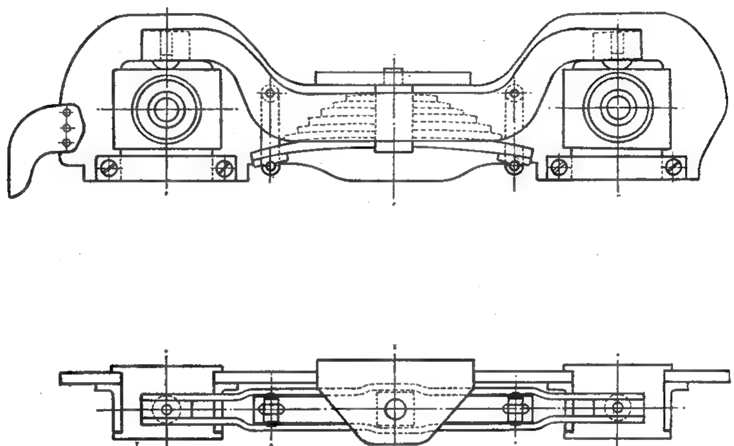
In this book, however, Mr. Bartley has considerably extended the range to cover not only several types of ships, but subjects of almost any kind. His instructions are clear and concise ; the materials and equipment required are not elaborate or expensive, and the methods described do not involve a high degree of skill. In short, the book is a complete guide to an instructive, amusing and satisfying occupation for the long, winter evenings.

"Britannia" in 3-in. Gauge

by "L.B.S.C."

PLEASE accept your humble servant's apologies for the break in the notes about the little lion-and-wheel brand engine, but the special reminiscence for the Exhibition number, plus one or two other unexpected diversions, completely upset my timetable; and unless I can settle down to drawing without untimely interruptions, I'm absolutely sunk. Howsumever, [redacted] the poet saith, we are on the road once again, and I hope there won't be any more lost time on the journey. Incidentally, in the old days on the L.B. & S.C.R. it was no uncommon thing for a driver and guard, to "toss up" as to whether a couple of minutes lost on a trip, should be booked to "locomotive" or "traffic" causes! Platform delays were our chief headache—passengers didn't have the "Milly Amp" boarding and alighting complex in those days!

On the full-size class 7's, the bogie springing is equalised. The equalising beams are each made from two pressed plates, the spring being between them; but the suspension is by way of being unique. The ends of the springs have oval holes in them, through each of which a single hanger passes. This hanger has an oval cotter at each end, taking [redacted] bearing in a plate shaped to receive it. The bottom plates just bear against the underside of the ends of the longest spring plates, but the top ones are riveted between the sides of the equalising beams. The whole of the stress comes on the cotters, which are [redacted] fixture in the hangers, the latter naturally being in tension. I found that by [redacted] little judicious wangling, the [redacted] arrangement could be used for the little engine, thus keeping to big sister's characteristics, and I was able to simplify it [redacted] little. Instead of the oval cotters in the hangers, round silver-steel pins are used; the lower one bears on [redacted] plate underneath the spring, but the upper one passes through holes in the equalising beam, the hanger being kept central by [redacted] washer at each side. The hoop or buckle of the inverted leaf spring has [redacted] boss turned solid with it, which not only fits the hole in the big side bearing bracket on the bogie frame, but comes in mighty handy for the pinching screw which holds the plates together in the hoop.



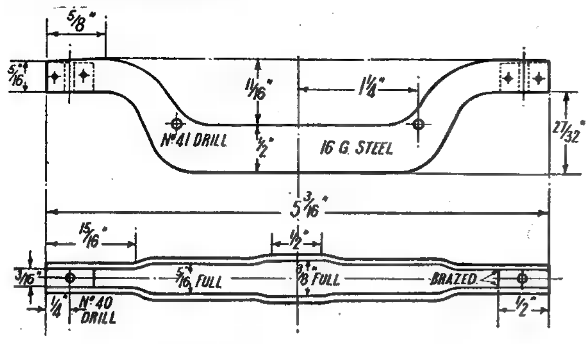
Arrangement of bogie springing

As I have already given alternatives, such as plain-bearing axleboxes and so on, for those who wish to build the engine as simple as possible without sacrificing efficiency—*very* important, that!—I have shown an alternative arrangement which makes use of a cast equaliser and two spiral springs sunk into pockets drilled in it. This will be perfectly satisfactory in service, though it doesn't look so nice as the arrangement on the big engine.

Equalising Beams

I hope nobody faints when they take a look at the plan of the assembled equaliser! It is just a piece of cake, to cut the four beams from $\frac{1}{16}$-in. steel sheet, which should be soft. If bright rolled strip is used, this should be annealed before commencing operations. Mark out one plate, drill the two holes for the upper hanger pins, the location of which is clearly shown; then drill the others, rivet temporarily together, and go ahead and cut the lot to shape at one fell swoop. Don't forget to leave the plates full

length, to allow for the bending. It is in the latter job where builders will have to watch their step. The bending didn't worry me in the least, thanks to that invaluable Diacro bending brake. I had a sort of trial run on [redacted] bit of $\frac{1}{2}$ in. $\times$ $\frac{1}{16}$ in. bright steel strip, and never even bothered to anneal it, but marked out the location of the bends and got busy. In a matter of minutes, the bit of strip had the correct sets in it, so I went right ahead and did the four beams, passing a silent but none the less hearty vote of thanks to the kind friend who sent the machine.



Equaliser beams

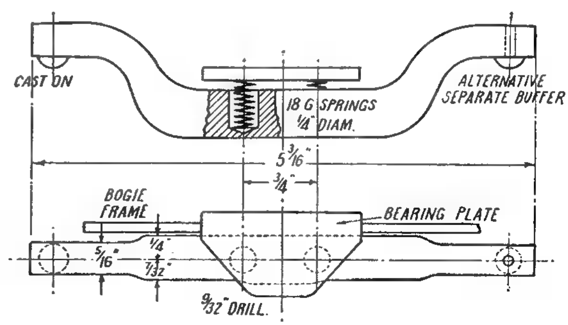
The job can be done in the bench vice. For the middle bend, where the spring hoop fits, put a piece of metal, the width of the spring hoop, against one jaw. Put two more against the other jaw, $\frac{3}{8}$ in. apart. Did I hear somebody say, how on earth do we make them "stay put"? Bless your hearts and souls, do what young Curly did, umpty years ago; bend the top of each piece at right angles, so that it rests on the vice jaws. Then put your beam between, turn the handle of the vice with a hefty squeeze, and you'll get a Crewe or Swindon "set" in two wags of a dog's tail. The other bends can be made in a very similar manner, using longer "pressing blocks." It's easy when you know how! Just [redacted] little care, and common "savvy"—that's all.

The end pieces, which connect the two plates, [redacted] just small blocks of mild-steel, $\frac{1}{2}$ in. long. $\frac{5}{16}$ in. wide, and $\frac{3}{16}$ in. thick. Put the block between the ends of the beams, and use a toolmaker's cramp to hold the lot together, whilst [redacted] couple of $\frac{1}{16}$-in. rivets are put in, to hold the blocks in position whilst brazing. Apply some wet flux (Boron compo or similar) heat to bright red, and touch the joints with [redacted] bit of soft brass wire, or $\frac{1}{16}$-in. Sifbronze rod, if you have any. Quench in clean water only, and scrape off any burnt flux. By the way, several readers have asked if they can paint the bits [redacted] they [redacted] made, to save having to dismantle the engine later on. Sure—go right ahead. The big engines have black frames, wheels and cylinders, smokebox and chimney; green boiler and cab, green tender, with the hungry lion in the middle, standing over his wheel and hoping somebody will throw him a few scraps (he won't get any from the footplate if he keeps putting his tongue out at the driver and fireman) red buffer beams, and inside framing. It wouldn't be me if I wasn't different, so my engine is royal blue, including wheels and cylinders (when the latter are finished) and the inside of frames pearl grey. If you paint your bogie frame and equalisers black, they will be dry by the time the springs are ready for erection.

Leaf Springs

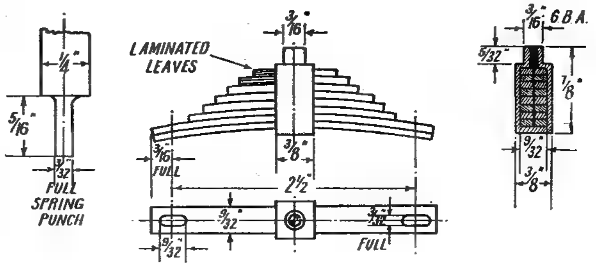
The liveliest kind of leaf springs that I have so far used, is the type devised by Tom Glazebrook, in which each leaf is made up from several thin laminations. The result looks just like the big fat springs that see you doing the needful on full-size engines, whose spring plates are often $\frac{5}{8}$ in. thick; and it seems [redacted] bit of a wonder how on earth they flex to such a trivial thing as a gap between two rail ends. The little springs, when made as above, will flex perfectly, and the action is fascinating to watch. I noticed those on *Tugboat Annie's* pony truck and tender the other evening, when she was being driven by my three good friends from the Tunbridge Wells club, who were on their annual visit. The spring plates for *Britannia* should be 9/32 in. wide, but $\frac{1}{4}$ in. would do, if the exact width isn't readily obtainable. The thickness should be about 0.010 in., but the exact thickness doesn't matter exactly, as long as the steel is quite flexible; three or four laminations, or even more, can be used to make up each spring plate, the proportions being kept as shown in the illustration, and the thickness of the complete spring, where it passes through the hoop, being approximately $\frac{9}{16}$ in. Don't forget that the longest plate is double thickness.

I spilled the beans on how to punch clean holes in hardened steel, in the very early days of the Live Steam notes, when there were discussions [redacted] the best ways of doing the job, in our correspondence columns. One of the ways suggested, was to make [redacted] deep centre-pop on one side of the plate, and file off the resulting pimple on the other side. When repairing gramophones for [redacted] friend in the trade—alas! long since passed on—I punched hundreds of governor springs with



Alternative cast equaliser beam

[redacted] simple punch made [redacted] shown in the detail illustration, which is self-explanatory. You just lay the spring steel on a flat block of lead, hold the punch vertically on the site of the hole, and do what Bert Smiff calls 'it it wiv an 'ammer. Don't have the punch too hard, temper it to dark brown, or the edge will chip; and give it not less than the taper shown, or it will split the spring steel instead of forming [redacted] clean hole. First punch the ends of the oval hole in *Britannia's* spring plates; then put the punch between them, and knock out the middle bit. A very hard smooth watchmaker's file will remove any raggedness between the punchings.



Built-up leaf spring

Should any trouble be experienced in assembling the plates to form the complete spring, make a weeny punch, the size of a No. 55 drill. Punch [redacted] hole in the middle of each spring plate, and assemble the whole bag of tricks on a domestic blanket pin. Cut the ends off, and rivet flush. The pin needn't be too tight, as the hoop prevents it coming out.

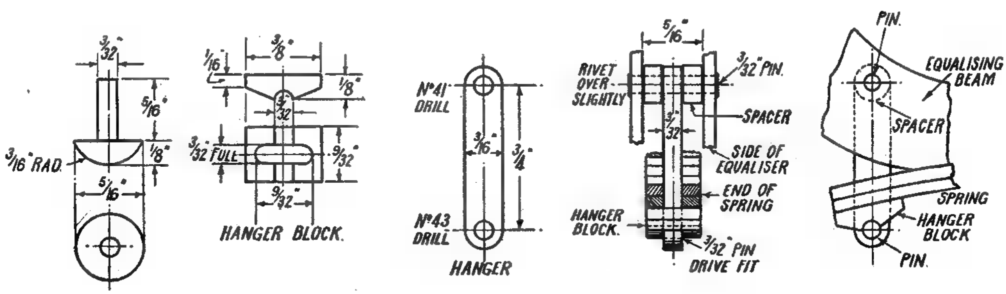
Spring Hoops [redacted] Buckles

The "generally-accepted" way of making spring hoops is to form the rectangular hole by drilling and filing, which pleases Inspector Meticulous, and is all right as far as it goes, provided that the operator behind the file, can use it properly. However, there are less tedious methods. I did mine by slotting out the ends of [redacted] piece of ⅜ in. square steel rod on the milling machine, to a width and depth equal to the dimensions of the spring at its thickest part. The rod was then chucked in the four-jaw, and the ends parted off to ⅞ in. length. The slotted pieces were then placed, open end down, on a strip of mild-steel ⅜ in. × $\frac{1}{16}$ in., and brazed at each side. The strip was then cut flush with the outsides of the slotted pieces of steel, and I now had two hoops with [redacted] rectangular hole through each, right size and sharp corners. The outsides were trimmed with [redacted] file, and the hoops chucked truly in the four-jaw, the top spigots turned, drilled and tapped for the set-screws. All the brazed-on end has to do, is to hold the spring in place; all the bearing stress comes on the end where the boss is.

A very simple way of making a very good hoop, is to use [redacted] piece of ⅜ in. × $\frac{1}{16}$ in. mild-steel strip bent into [redacted] rectangle, with [redacted] little circular boss brazed on, to fit the hole in the bearing bracket, and take the set-screw. File up [redacted] short piece of mild-steel bar, to the size of the middle part of the spring; anneal the piece of strip, then bend it around the bit of bar, in [redacted] manner somewhat similar to the method I gave for bending up the pump stand for *Tich*. Instead of bending the ends outward, to form lugs or feet, bend them inwards, so that they meet and form [redacted] complete rectangle. Part off two ⅛-in. lengths of ⅜-in. round mild-steel, in the three-jaw; place one of them on the end of the rectangle, over the join, and braze it. Chuck the lot in the four-jaw, with the boss outwards, then turn, drill and tap as above, and face off the boss to length.

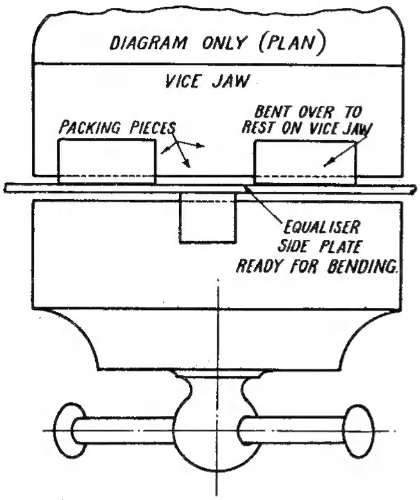
Hangers and Blocks

The hangers [redacted] merely 1 in. lengths of 3/32 in. × $\frac{3}{16}$ in. mild-steel, with [redacted] No. 41 hole at one end and [redacted] No. 43 at the other, drilled at ¾ in. centres, and the ends rounded off. The blocks, or plates, are made from ⅜ in. × ⅛ in. mild-steel, and are 9/32 in. wide. Each has a semicircular groove in it, to accommodate the bottom hanger pin; and these can be formed in a matter of seconds, by clamping two of the pieces of steel together in the machine vice, and drilling [redacted] No. 41 hole on the joint line. When you remove them from the vice, each will have the required half-round groove in it. The slot can be formed by drilling 3/32-in. holes and joining them by aid of a rat-tail file, or drilling one hole, and using [redacted] 3/32-in. dental burr to extend it into [redacted] slot. Put the burr in the three-jaw, and clamp



Suspension details

the block on its side, under the slide-rest tool holder, packed up to the right height to allow the burr to enter the drilled hole. Feed steadily with the cross-slide, and run the lathe at the highest permissible speed. Don't forget a drop of cutting oil.



How to put the sets in equaliser plates

The buffer pads, which look like snap-head rivets, and fit into the recesses on top of the axleboxes, are turned from $\frac{5}{16}$ in. round mild-steel. Hold the rod in three-jaw, turn the shanks first, and part off at $\frac{1}{8}$ in. from the shoulder; reverse in chuck, round off the heads, and fit the shanks into No. 41 holes drilled in the blocks in the ends of the equalising beams.

How to Erect

Drive a $\frac{1}{4}$ in. full length of 3/32-in. silver-steel through the holes in the bottom ends of the hangers; put on the blocks or plates as shown, and poke the hangers through the slotted holes in springs. Put the whole lot in position between the equaliser beams, then put a 3/32-in. silver-steel pin through the holes in each of the beams and the tops of the hangers. A spacer washer goes on each side of the hanger, to hold it centrally; these are just 3/32 in. full slices parted off a $\frac{3}{16}$-in. steel rod previously drilled No. 41, as shown in the end view. Rivet the ends of the pins over slightly, to prevent them coming out of their own accord. Take out the bogie axleboxes, put the spring and equaliser assembly in place, the boss or spigot of the spring hoop going through the hole in the side bracket on the bogie frame; replace axleboxes, put on the hornstays, and Bob's your uncle once more. The brackets press on the spring hoops, the weight being transferred via spring and hangers to the equalisers, which in turn bear on the axleboxes via the buffer pads and countersinks.

The alternative cast equaliser with spiral springs, needs no detailng. Merely clean the castings with a file, drill spring pockets, insert springs, and erect as given above. Next stage, sliding block centre bearing.

THE DERBY REGATTA

THE Derby regatta held recently at Allestree Park, was run under perfect weather conditions and competitors and visitors seemed to have an enjoyable time.

All races were over 500 yds. and competitors were allowed the choice of $\frac{1}{2}$ lap or $1\frac{1}{2}$ laps start before timing commenced.

The first event was for a handsome trophy presented by Messrs. Rolls-Royce Ltd., for Class "C" boats, and this was won by Mr. Collier, of Coventry, who put up a very fine show at 46.48 m.p.h., Mr. Mitchell being second at 44.65 m.p.h., although he had the misfortune to lose half a propeller blade.

The 10 c.c. restricted class for the Derwent Shield was won by Mr. Clare at the modest speed of 29.63 m.p.h.

"B" class boats were next on the line and Mr. Mitchell came to the fore with a faultless run at 46.91 m.p.h. with *Beta II*.

Mr. K. Williams had a runaway win in class "A" with *Faro* at 58.77 m.p.h., being over 20 m.p.h. faster than the second man home.

At the close of racing, prizes were presented by Mrs. I. W. Moore.

Results

Class "C." Rolls-Royce Trophy
- 1st. Mr. Collier (Coventry), *C.V.7*, 46.48 m.p.h.
- 2nd. Mr. Mitchell (Runcorn), *Gamma*, 44.65 m.p.h.
- 3rd. Mr. Barnes (Derby), *Dagwood*, 41,23 m.p.h.

Class "C" (Restricted). Derwent Shield
- 1st. Mr. Clare (Derby), *Imshi II*, 29.63 m.p.h.
- 2nd. Mr. J. Brearley (Derby), *D 14*, 22.32 m.p.h.

Class "B"
- 1st. Mr. Mitchell (Runcorn), *Beta II*, 46.91 m.p.h.
- 2nd. Mr. Churcher (Coventry), *Annette*, 40.90 m.p.h.

Class "A"
- 1st. Mr. K. Williams (Bournville), *Faro*, 58.77 m.p.h.
- 2nd. Mr. Tomkinson (Altrincham), *Rene*, 37.05 m.p.h.

PRACTICAL LETTERS

Reducing the Power of a Motor

DEAR SIR,—Regarding the above query, No. 9921, I am afraid your reply is incorrect.

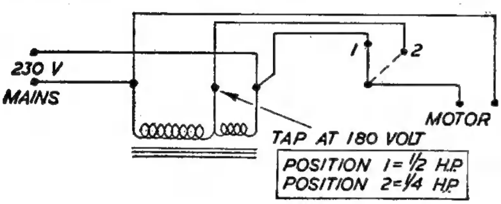
You *can* effectively reduce the h.p. of a single or three phase motor of the cage rotor type, by reducing the line voltage. There is, of course, a limit, about 25 per cent. is the maximum, after which the starting and pull out torque is too low.

The line voltage must, however, be constant, a resistance is useless, as this varies with the current passing, and starting of the motor would be uncertain.

Assuming your querist "D.F.L." is operating from 230 V, reducing the line voltage to 180 approx. will make the motor, which is normally ½ h.p., as near as necessary to ¼ h.p., with a corresponding reduction, in pull out and starting torque, accompanied with a reduction in starting and running currents; all these conditions added appear to be what "D.F.L." is asking for.

His solution is a small auto transformer which maintains a constant voltage irrespective of load, and allows for a heavy overload during the very short period of starting.

This transformer is connected via a two-way switch thus (see diagram).



This transformer handles only 50 V at 4 A max., which is 200 VA, but being wound auto, the core size is only 100 VA., using then a core size of approximately 1½ sq. in.

All the information concerning winding, etc., I shall be glad to provide to "D.F.L." if he wishes to proceed with the manufacture of the transformer.

Also, I must say that your statement regarding the removal of a starting condenser to reduce the "quick start" is wrong, and can only lead to trouble.

The auxiliary or phase splitting winding of a capacitor start motor, is of special design, according to the amount of starting torque required from the motor, and in most cases, if you short out the condenser the motor will not start at all, only growl, and take a very large amount of current, up to 20 A or so.

In other cases the motor might just about start, with very poor torque, and also with heavy current.

You can reduce the initial starting current, and torque by substituting a condenser of smaller capacity, but if you wish to leave out the condenser entirely, the starting windings *must* be completely rewound with a much larger number of turns of much smaller gauge wire, the reason being:

Phase angle of auxiliary winding of capacitor start is created by winding of *low* resistance and high induction, and led by capacitance.

Phase angle of plain split phase is *via* a *high* resistance winding of low induction, momentarily introduced.

It therefore does not pay to tamper with manufacturers' designs, functions of starting windings are not so simple as they appear.

Finally, the object of a starting winding connected to a point half way across the running windings, is used only on high torque refrigerator motors; condensers are of very high capacity, from 120 to 200 Mfd., peak working voltage of 150, and if you leave out this condenser the motor definitely will not start, and most likely blow out your main fuses without any hesitation.

Yours faithfully,

Cambridge. C. T. WRIGHT.

Boilers

DEAR SIR,—Mr. Austen-Walton's reference to steam boilers in your issue of August 2nd, prompts me to give my personal experience with steel boilers. My first locomotive, 7½ in. gauge, was built some 60 years ago; it had a 3/16 in. steel boiler with copper tubes and a steel coil firebox, and no stays. I eventually parted with it and lost sight of the engine until a few years ago, when I heard that it was still in existence and in wonderful condition. In 1906 I built my large double-cylinder steam fire engine with a 7½ in. diameter steel boiler and copper tubes; it is now 45 years old and still carries the original pressure of 100 lb. and sometimes a little more! I also have a 10¼ in. gauge locomotive now 46 years old. It also has a steel boiler, 11 in. diameter, ¼ in. plate; sixteen years ago I thought it was time it had a new boiler, the original one having been in service 30 years and carried 100 lb. pressure to the end. Both these boilers had steel coil fireboxes and no stays, the original coil removed from the old boiler was found to be in such good condition that it was fitted to the new boiler and is still in use after 46 years and shows no sign of deterioration. At the moment I have four steel boilers on my larger models and twelve copper on the smaller. I have built many steel boilers from 5 in. to 11 in. diameter and all have given entire satisfaction. All feed, of course, on rainwater; their plates varied from ⅛ in. to ¼ in. Naturally, a boiler with ¼ in. plate and 5/16 in. tube plates would be heavy, but weight in a locomotive is an asset and a great help to adhesion; in fact, to this end I arrange my tender so that at least part of the weight of the driver sitting in the tender is transferred to the footplate to increase the load on the driving wheels to prevent wheel spin. Now whatever metal is decided upon there still remains the all important matter of scale deposit due to the use of hard water; this is common to all metals. I have seen the tubes of a Smithies type boiler completely choked by scale and the

copper tubes burnt through, and I know of cases where owners, to avoid this danger, use distilled water, a quite unnecessary expense when they might have used rainwater free of cost.

The result of a recent test I made may be of interest. Two aluminium kettles were used, one for rainwater and one for water from the main, the latter being treated and softened at the water works. Both kettles are alike and each is kept to its own job. They have now been in constant use for a month or so and the test shows that the rainwater kettle is absolutely clean inside and weighs just under 14 oz., whilst the main water kettle is badly coated inside and weighs over 18 oz. Surely the test justifies up to the hilt the use of rainwater for boilers. I have heard that rainwater is liable to cause priming, but have not found this to be the case, and I think it can safely be left to the superheater to be dealt with.

My boilers are open to inspection at any time by anyone who is really interested, and I am ready to explain any doubts that may exist.

Yours faithfully,

Bognor Regis. R. A. BRIGGS.

DEAR SIR,—Mr. Austen-Walton's article in the August 2nd issue, suggests that with boiler flue-tubes made of another material than copper (i.e., stainless-steel) there would be a drop in the heat conductivity figures.

Whilst this is quite correct, in practice the limiting factor in the transfer of heat from the hot flue gases to the water in the boiler consists of the resistance to the flow of heat of stagnant layers of water and flue gas on the respective sides of the tube wall, and it is these resistances, together with any layers of soot and scale, which determine the amount of heat which will be transferred to the water. Although different metals will offer varying resistances to the flow of heat through them, the resistance offered by tubes of all the common metals would be negligible compared with the scale and stagnant layer films mentioned above, and the effect of changing from copper to stainless-steel for the flue-tubes would have no measurable effect on the efficiency of the boiler.

In any case, it is well known that with the locomotive-type boiler most of the heat is transferred to the water from the firebox by direct radiation from the fire, and in this case a copper firebox is of some value in improving efficiency.

However, the writer has in his possession an old locomotive boiler about 6 in. diameter, made of what is probably Lowmoor iron, about ⅛ in. thick (it is a ductile metal which does not seem to rust readily). The firebox is of iron and I do not consider that the steaming of the boiler would be much improved were the firebox of copper. I estimate the age of this boiler at over 50 years, but it is only fair to add that before it came into my possession I do not think that it had been steamed a great deal. It will be interesting to see how long it lasts ; it undergoes a hydraulic test regularly.

All that will happen if the stainless steel construction mentioned by Mr. Austen-Walton is followed is that to raise the same amount of steam as with the copper boiler a slightly greater quantity of fuel will need to be burnt, but in a 1 in. scale locomotive this would not be noticed.

One thing to be watched with a stainless-steel boiler is that stainless-steel is only so under certain conditions, and the writer is not sure whether or not corrosion would ensue due to electrolytic action between the boiler and possibly copper tubes, firebox, and bronze fittings.

Yours faithfully,

Sutton, Surrey. G. RANDELL.

To P.R.O.s and Others

DEAR SIR,—May I make a plea that all announcements in the "M.E." diary of forthcoming events should be accompanied by times of opening, or at least some such general indication as "evening," "afternoon and evening," etc.? I took a day's holiday recently in order to take my family to the Bolton Society's exhibition, only to find (after a complicated journey of over an hour, as it was necessary to travel by train in order to take the baby's pram) that the opening time was 6.0 p.m. This is bedtime, normally, for the children, and certainly cannot be extended long enough to enable us to see anything with any pleasure to anyone, so we had to come home.

I am glad to see that many of the events in the "Diary" give times of opening, and am sure it would be widely appreciated if all did so. My elder daughter was very disappointed to miss the promised "baby puff-puffs."

Yours faithfully,

Rawtenstall. K. HOWARTH.

Oscillating Steam Winches

DEAR SIR,—In the July 26th issue of THE MODEL ENGINEER, on page 113, there is an article on a small oscillating steam winch made by Mr. H. E. Rendall, who states that they were much used on board ship in the latter part of the 19th century, and he wonders if any of them or any drawings are still in existence.

About 1949 I was at Matlock Bath, in Derbyshire, and in a field not far from the railway station came across a small shaft that has certainly been sunk only recently; it was not there in 1946 at any rate. What the mine was for I do not pretend to know. It went into a hillside at an angle, but it was the winding tackle that attracted my attention. It was a small oscillating winch, only about 2 ft. high, the two cylinders were at 90 degrees to each other on a common crankpin and the control valve had three positions, forward, stop and reverse.

The whole arrangement was very much the same as the small Stuart steam engines we used to see before the war.

The winch was evidently worked by compressed air, as the pipe from it went into a nearby shed with an air compressor in it driven by some sort of internal combustion engine.

The vee twin engine of the winch was at right-angles to the drum and drove through gearing to it. Unfortunately, I cannot remember the name of the maker, and do not know if the engine is still there.

Yours faithfully,

Leicester. R. TAYLOR.

An Interesting Old Model Steam Engine

DEAR SIR,—I was very interested in the illustrations and description of Mr. F. P. Lewis's engine in THE MODEL ENGINEER, June 21st issue. I saw this engine or one like it here, in Ipswich, many years ago, it may be thirty or more. I was not living here then but was up to do a bit of shopping and I saw the engine in a pawnshop window; it did not look new but was in nice condition. I specially noticed the connecting-rods, as mentioned by Mr. Lewis, and also the unusual layout of the engine.

Yours faithfully,

Ipswich. G. WELHAM.

CLUB ANNOUNCEMENTS

The Society of Model and Experimental Engineers

The first meeting of the 1951-52 session will be held at the Caxton Hall, Westminster, on Saturday, September 15th, 1951, at 2.30 p.m., when Mr. C. R. Fox will give a talk entitled "Finishing and Painting Model Work." Members who have admired and envied the finish of some of the models at the exhibition will find this an opportunity to gather some practical help from an acknowledged expert.

Visitors will be welcome and tickets for admission together with particulars and forms of application to join the society may be obtained from the Hon. Secretary, A. B. STORRAR, 67, Station Road, West Wickham, Kent.

P.A.D.S.M.E.E.

Members of the Plymouth and District Society of Model and Experimental Engineers were recently given a very interesting talk on "Railway Emergencies" by one of the members, Mr. R. Bragg, who, as well as being a railwayman by profession, is a keen model railway enthusiast with a very fine and elaborately signalled layout. Mr. Bragg included in his talk some of his own railway experiences as a signalman in the Southern Region, and concluded by answering many questions.

Hon. Secretary: H. A. TUCKER, 42, Cobbett Road, Plymouth.

Harrow and Wembley Society of Model Engineers

We are holding our annual exhibition at Victoria Hall, Station Road, Harrow, on Saturday, September 22nd, 1951, from 9 a.m. to 9 p.m. Particulars and entrance forms from he Hon. Secretary, C. E. SALMON, 11, Brook Drive, Harrow.

International Radio Controlled Models Society

Forthcoming meetings of the above society are as follows:—

London Group. Sunday, September 9th, at 2 p.m., at the Horseshoe Hotel, Tottenham Court Road, London.

Tyneside Group. Extra meeting on Saturday, September 8th, and another meeting at the end of the month. Meetings are held at 176, Westgate Road and begin at 7.30 p.m.

Manchester Group. Sunday, September 16th, at 2.30 p.m., at Wellington Chambers, 2, Victoria Street, Manchester. Mr. C. H. Lindsey will speak on "The Design of Reed Systems."

Acting Hon. Secretary: C. H. LINDSEY, 292, Bramhall Lane South, Bramhall, Stockport, Cheshire.

Hastings and District Model Engineers' Society

The society's annual exhibition held August 4th-11th at the New Pavilion, Hastings, was one of the best yet seen. Some 250 models were on show in addition to a working model stand, race car and locomotive tracks. Owing to the uncertainty of enough of the society's locomotive track being finished in time for the exhibition, we were indebted to the Orpington Model Engineers' Society who kindly loaned us about 100 ft. of their own track. Some 75 ft. of the Hastings ground level track lay alongside. Unlike previous years, the track this time was laid down the centre of the hall with the model stands displayed around, and the indispensable club office tucked away in one corner.

Race car meetings were held on the first Saturday, Friday and last Saturday evenings; on Friday evening, members of the Medway Society took part in a competition with the home club and some good speeds were recorded. Outstanding among these was the speed set up by Mr. Kay (Medway) with his 2.5-c.c. own design "Teardrop" car; checked by five stop-watches, this car recorded a speed over nine laps which equal a ½-mile, of 80.77 m.p.h.

At the August general meeting, members heard the "Frank" lecture read by the car section leader, H. F. Smith. Illustrated by some 64 slides, the lecture was sent over to this country by Howard Frank, of New York, and members found it interesting, but very technical, to learn what our American friends do to obtain such high speeds.

Hon. Secretary: W. BROGAN, 4, Mount Pleasant Road, Hastings.

The Axminster and District Model, Experimental and Photographic Society

The Axminster and District Model Engineering and Photographic Society is holding its fourth exhibition at the Church Rooms, Axminster, September 17th to 22nd inclusive from 2.30 p.m. to 10 p.m. daily.

The exhibition is to be opened and judged by G. W. Arthur-Brand.

Hon. Secretary: D. K. J. GRAYER, Station House, Axminster.

The Oldham Society of Model Engineers

Our track and pond are sufficiently advanced for running on and will be officially opened on Sunday afternoon, September 9th, at 2.30 p.m.

In addition to cars and boats, we hope to be able to have a portable railway track in operation for this gala day. The site is at Hollinwood, half way between Manchester and Oldham on the Oldham road, but reached along Victory Street, close to Roxy cinema.

Any car, boat or locomotive fans will be welcome at this event which will be free and easy with no prizes.

Club meetings as usual second and fourth Friday in each month, Room No. 3, King Street Co-op.

Please note hon. secretary's change of address.

Hon. Secretary: F. MILLER, 22, Cleeve Road, Oldham.

City of Leeds Society of Model and Experimental Engineers

Meetings of the above society will be held at Salem Church Institute, Leeds Bridge, on Tuesday, September 18th and October 2nd, at 7.15 p.m. The business will be chiefly concerned with the exhibition which will be held in the Leeds Corn Exchange, October next, 4th, 5th and 6th inclusive. Please let us have a good turn up of members as there are jobs for all.

Hon. Secretary: R. G. COLBRAN, 9, Church Wood Avenu Leeds, 6.

The Kent Model Engineering Society

With the kind co-operation of the Woolwich Borough Council, the society have erected the permanent track in Sutcliffe Park, adjoining Kidbrooke Park, Eltham, and locomotive running takes place every Saturday and Sunday afternoon from 3 p.m. to 6.30 p.m. The track at present is 190 ft. long, and will shortly be extended to 400 ft. It may be possible, next year, to make the track a continuous one, consisting of two straights 350 ft. and 200 ft. long with two 60 ft. radius loops. Members are asked to assist at weekends, whenever possible, and other locomotive owners are always welcome.

Hon. Secretary: F. H. GRAY, 73, Sangley Road, Catford, S.E.6.

The Coventry Model Engineering Society

We are holding our fourth post-war exhibition at the Sibree Hall, Coventry, from September 12th to 15th inclusive.

Work is progressing steadily on the track at the Memorial Park, and approx. 150 ft. of track is now laid.

Future meetings are:—

September 12th-15th. Exhibition at Sibree Hall.

September 28th. Lecture on "Ornamental Turning."

October 12th. Lecture, "Old-time Locomotives as Prototypes for Models," by Mr. J. N. Maskelyne.

October 26th. Film show.

Hon. Secretary: L. G. BEDDER, 105, Butt Lane, Coventry.